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**for the Behavioral and Social Sciences**

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# Tailored Training in Army Courses

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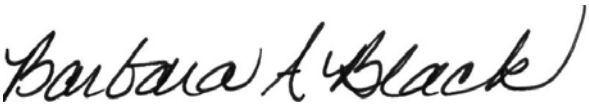

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14. ABSTRACT *(Maximum 200 words)*: The research aimed to identify different ways Army course instructors adapt or tailor their training to meet student needs. Interviews with 81 instructors from 51 courses across four installations were conducted. No single template existed regarding how instructors tailored, and some typical modes of tailoring were not described. Instructors provided details of how their courses were conducted as well as impediments to tailoring training. Characteristics of the courses and the instructors that increased the likelihood of tailoring training were defined. Courses that have well-defined and enforced graduation requirements aimed at producing students with a high level of proficiency were the ones most likely to tailor training to student needs. Results imply that tailoring in Army courses, as a whole, is probably limited. The major factors related to tailored training, to include instructor expertise with relevant pedagogical skills and assessment techniques, are integrated in an overall model. Considerations regarding how to initiate tailoring in courses, and questions regarding tailored training in the Army that emerged from the research are presented.

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# Tailored Training in Army Courses

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TAILORED TRAINING IN ARMY COURSES

## EXECUTIVE SUMMARY

Research Requirement:

Adapting or tailoring training, both training content and method, to student needs provides an enhanced learning situation for individuals, regardless of their level of expertise. Effective tailoring should be based on assessments of critical individual differences at both the start of training and during training. While specific examples of tailoring training in Army courses are evident, the extent and forms of tailored training to students across Army courses is not known. This research aimed to identify different ways instructors adapt or tailor their training to meet student needs and individual differences. In addition, we wanted to identify factors that facilitated tailored training. Finally, for courses where the training was not tailored, we wanted to determine the reasons.

Procedure:

Using information in the Army Training Requirements and Resource System, a set of course parameters and associated rating scales that could possibly identify courses likely to conduct tailored training were developed. The rating scales were applied to 304 courses across six Army installations. The four installations with the greatest number and variety of highly-rated courses were selected. Researchers interviewed 81 instructors from 51 courses to obtain details on how they tailored their courses to meet student needs. Instructors were asked how their courses were conducted as well as what, if any, impediments existed to tailoring training.

Findings:

Based on the instructor interviews, the course parameters and rating scales used to identify the likelihood of tailored training in a course were refined. Courses with well-defined and enforced graduation requirements aimed at producing students with a high level of proficiency were the most likely to tailor training to address student needs and differences. These were functional courses. When tailoring occurred, given the diversity of courses in the sample, it varied with the course; no standard template or model occurred. Examples of tailoring described by the instructors were situations approximating tutoring, use of small groups, peer assistance, remediation, and changing the difficulty of exercises and tasks. On the other hand, instructors never used certain forms of tailoring common in the research literature such as accelerated learning, self-paced learning, and ability grouping. Other characteristics of the courses where tailoring occurred included at least one of the following factors: frequent student assessments, a heterogeneous student population, many enforced prerequisites, and increased opportunities for first-hand experiences. Instructors who indicated they tailored to individual differences took pride in their students' success, were given the flexibility to tailor, and exhibited expertise in their domain. Impediments to tailoring training included limited resources to prepare for tailoring, limited or no instructor training, fixed programs of instruction, and lack of student assessments on which to judge student status. One limitation of the research was that

formal observations of courses were not possible; therefore the extent of tailoring was not documented and the degree to which it corresponded to the tailoring approaches in the research literature could not be verified.

Utilization and Dissemination of Findings:

Attempts to apply one form of tailoring to all Army courses would not be appropriate nor effective, as a single template cannot adequately address the diversity in the intent of Army courses and the differing student populations. It is particularly important to tailor in courses where graduates will be assigned to positions of responsibility where individual competency is critical. Before tailoring can be implemented, decisions must be made regarding where tailoring is needed in a course, and what type of tailoring is most appropriate. Impediments must be addressed. In particular, instructors must be trained in the requisite pedagogical skills that support the forms of tailoring appropriate to their courses as well as how to regularly and effectively assess student performance. Time, resources, and the flexibility to tailor training must also be provided to instructors. Findings were briefed to the U. S. Army Training and Doctrine Command and Army Training Support Center representatives in June 2011.

TAILORED TRAINING IN ARMY COURSES

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# TAILORED TRAINING IN ARMY COURSES

## Introduction

As an all volunteer force, the U. S. Army receives personnel with myriad backgrounds, experiences, and capabilities. They are extremely heterogeneous in both mental and physical abilities, ranging from some who lack a high school education to others with advanced academic degrees, and from some who did not participate in high school sports to others who have played professional sports. These personnel are then grouped into training units so Drill Sergeants (DSs) can transform them into new Soldiers. A key aspect of the transformation is training this diverse mix of trainees on more than a hundred basic combat skills[1]. Also of note, these basic skills span a large spectrum including shooting weapons and navigating cross-country through woods, to performing life-saving tasks and marching in formations.

The heterogeneity within the population of Soldiers continues throughout the Soldiers' time in the military and can increase depending on each individual's career path. For example, the Army's education system for non-commissioned officers (NCOs) and officers provides similar challenges in that Soldiers attending courses arrive with vast differences in knowledge, skills, and experiences. For example, some officers attending their career course will arrive following a recent deployment to a combat theater where they actively practiced their branch skills while others served in garrison or Initial Entry Training (IET) duties not directly related to their specific branch. Similarly, some NCOs attend courses following a combat assignment performing duties directly in line with their military occupational specialty (MOS) and others might be serving as recruiters or DSs in an IET unit.

Army instructors must be prepared to conduct training that takes into consideration the diverse backgrounds and needs of students. They face a tough challenge. Unlike the general academic arena where teachers choose their career, complete extensive preparatory training, and remain in that profession for an extended period of time, personnel assigned duties as trainers and instructors in the Army routinely serve in this position for about two to three years between other duty assignments. Army instructors generally receive some rudimentary training prior to this duty assignment, but the training typically does not cover how to tailor training to meet student needs and differences (Bickley et al., 2010).

## Types of Tailored Training

By tailoring we mean providing groups or individuals more appropriate training in order to increase proficiency, based on assessments of salient individual differences and regardless of expertise within a domain. To adapt to different levels of expertise, it is assumed that alternative modes of instruction are required. Also, tailoring training requires instructor skill/knowledge and resources which match and enable the type of tailoring that is implemented.

[1] The Soldier's Manual of Common Tasks (Department of the Army [DA], 2006) lists 172 Warrior Skill Level 1 tasks. However, due to resource constraints some of these tasks are not trained in IET.

Tailoring occurs in many forms. Two well-known means of tailoring are grouping by ability and human tutoring. When grouping by ability is used, students are pretested and divided to create homogeneous groups. This technique is most effective when the instruction and instructional materials are adapted to the ability group as compared to simply placing students into homogeneous groups (Kulik & Kulik, 1982, 1992). Human tutoring is often viewed as the ideal means of tailoring for increasing individual achievement levels (Bloom, 1984). Frequently, it is the standard by which other methods of training are compared (Kulik, Kulik & Bangert-Downs, 1990). Human tutoring settings involve one to three students. Good tutors use scaffolding, provide students with just enough information to do tasks on their own, and understand when providing less support will substantially increase student's learning and confidence in their problem-solving ability (Juel, 1966; Merrill, Reiser, Merrill, & Landes, 1995). Human tutoring is typically used address individual learning problems in basic areas such as math and reading. Intelligent tutoring systems are computer-based systems that attempt to "automate" the human tutoring process, but major challenges remain to be solved in this area before such systems can become a major means of tutoring (VanLehn, 2006).

Still other tailoring training approaches exist. Accelerated learning and self-paced learning adapt to the rate at which individuals learn. Each is effective. Accelerated learning, in which time to learn is compressed, has been shown to be effective with talented students (Kulik & Kulik, 1984). An advantage of self-paced learning, via computer-based instruction, is that it saves time, but students might not complete the training on their own unless they are monitored (Gibbons & Fairweather, 2000; Kulik et al., 1990). Online learning also allows students to go at their own pace (Means, Toyama, Murphy, Bakia, & Jones, 2010). The self-pacing approach is particularly relevant to the military as research has shown that the time to execute computer-based training exercises can vary greatly, with the fastest Soldier being two to four times quicker than the slowest (Dyer & Salter, 2001; Dyer, Westergren, Shorter, & Brown, 1997).

Aptitude-by-treatment interactions focus on situations where the best instruction for students with one set of aptitudes differs from students with another set of aptitudes (Snow, 1989). Some research in this area involves specific aptitudes such as spatial ability, but the most consistent finding in this body of research relates to the degree of structure in the training setting presented to the student (Snow, 1989) and its relationship to the prior knowledge possessed by students. Specifically, highly-structured conditions (e.g., teacher controlled, step-by-step, drills) tend to help low prior-knowledge individuals and hinder high-prior-knowledge individuals. On the other hand, low-structure treatments (e.g., reduced teacher assistance, problem-solving settings) benefit high prior-knowledge individuals and penalize low prior-knowledge individuals (Pashler, McDaniel, Doug, & Bjork, 2009).

Learning in small groups of four to six is viewed by some as a means of addressing individual differences (Cohen, 1994) in that small groups enable instructors to better monitor students who are struggling with tasks as compared to a lecture format. However, tailoring to individual differences in the sense of addressing both student weakness and strengths is not guaranteed, as the instructor relinquishes some authority and the extent to which peers assist others is often unknown. Consequently, the link to tailoring can be viewed as limited. Types of groups vary, with the distinction between cooperative, collaborative and competitive viewed as relevant to military training settings (Dillenbourg, Baker, Blaye, & O'Malley; 1996; Shute,

Lajoie, & Gluck, 2000). Cooperative groups involve a division of labor on a group task followed by merging the individual efforts. In collaborative groups, members share, negotiate, and attempt to influence each other to arrive at a group solution. With competitive groups, groups compete against each other. Tasks amenable to small group processes are complex tasks which cannot be solved by a single individual and have multiple, feasible solutions (Cohen, 1994; Shute et al., 2000).

The major means of tailoring just cited are considered forms of macroadaptation, where assessment of individual differences is formal and tailoring approaches are pre-planned. However, microadaptation also exists, whereby measurement is informal and tailoring methods are not pre-planned but are in direct and immediate reaction to students' questions, requests for help, and performance problems (Corno, 2008). Microadaptation is ubiquitous in classrooms and can occur in any macroadaptation form of tailoring which has a teacher-in-the-loop. Instructors observe and assess student performance and then respond to students as they progress through the instruction. Adept, experienced instructors can detect learning problems, recognize indicators of learning difficulty, and revise the teaching technique or process to best assist the student. This requires special pedagogical skills and abilities on the part of the instructor (Putnam, 1987), as well as the necessary resources (e.g., time, training material, training support assets) to immediately adapt in a responsive manner.

A general trend in the research related to tailoring is that much focuses on well-defined or well-structured domains such as reading, science, and mathematics. Also, in applied research settings, the student population is often elementary grade or junior high school students, and experimental settings are typically college students. The Army population differs, and course content and intent are not always similar to that examined in the research on tailoring, factors which inhibit direct transfer of research results to Army courses.

**Background for Army Tailored Training**

Some NCOs and officers attend instructor preparation courses prior to being assigned as instructors (e.g., Drill Sergeant School, instructor certification program). However, these courses do not always assure instructors are proficient in the tasks and skills they are to train, and the courses do not necessarily prepare them with the requisite pedagogical skills and tools to be able to effectively assess student learning and tailor training to the specific course content. In addition, Army instructors frequently provide information directly from standard training packages, and do not adjust the training presentation to the audience. They usually do not have the resources to divert from standard lesson plans and the training support packages. Nor are they versed in adjusting their training methods in the context of relevant learning theories. Training techniques are seldom altered to better suit the task or the knowledge and experience of the training audience (e.g., Bickley et al., 2010; Dyer et al., 2000; Leibrecht, Wampler, Goodwin, & Dyer, 2007; Tucker, McGilvray, & Leibrecht, 2009; Wampler, Dyer, Livingston, Blankenbeckler, & Dlubac, 2006; Wampler, James, Leibrecht, & Beal, 2007).

There are exceptions to this pattern. Examples of some tailored training approaches used in Army courses include:

- Assessing prerequisite knowledge: The Command and General Staff Officer Course assesses students' writing and reading abilities prior to the start of the course[2]. Students who lack a minimum proficiency level are encouraged to attend remedial classes.
- Monitoring student progress and adapting: While not done in all classes, some digital instructors closely observe student learning and will modify their teaching technique or have strong students provide assistance to weaker students (Leibrecht et al., 2007).
- Formally dividing students into groups and presenting training to meet each group's needs: The Field Artillery Battery Operations Course trains all battery members simultaneously. Soldiers are separated into groups based on their duty position within the unit (e.g., gun crews, fire direction center) and training addresses specific duty functions, both individual and collective skills[3].

While specific examples of tailoring training are evident, the extent and implementation of adapting training to the students across Army courses are not known.

One outcome of implementing tailored training in a course is that it becomes learner-centric, as individual differences, by definition, are formally and systematically addressed. A learner-centric focus is consistent with the Army's Learning Concept for 2015 (ALC 2015, Department of the Army [DA], 2011). The ALC 2015 document acknowledges that moving to a learner-centric model could impact instructor selection and training as this mode of training is more demanding, and requires additional skills (ALC 2015 stresses instructors being facilitators, able to use technology-enabled learning tools, blended learning, etc.).

This research effort explored the status of tailored training across Army courses. We wanted to identify different ways instructors adapt or tailor their training to meet student needs so these practices could be shared. In conjunction with this, we wanted to determine if we could identify factors that would predict, with some degree of confidence, the likelihood of tailored training being implemented in an Army course. Finally, for courses where the training was not tailored, we wanted to determine the reasons. By recognizing potential impediments and the factors that influence whether training is tailored, leaders can better influence how Army courses might be modified to address individual differences.

## Method

The challenge was to identify a sample of Army courses where the likelihood of tailoring training was high. Two key factors were considered in the selection process: course characteristics that could increase the probability of having tailored training and which installations had the highest volume of courses with these characteristics. Once courses were identified and sorted by installations, an interview protocol was developed to capture information from the instructors regarding how they conducted tailored training.

[2] Per the Chief of Curriculum Development, students complete the online Prentice Hall diagnostic writing test and the Nelson Denny reading test.
[3] Information provided by the course Chief Instructor.

**Initial Phase: Selecting Installations and Courses**

To identify courses of interest, we identified course parameters that might indicate the potential for tailored training. The intent was to establish an objective framework to rate courses according to the likelihood that tailored training might be conducted. We initially considered ten Army installations for potential data collection. Using information available in the Army Training Requirements and Resource System (ATRRS), we compiled the courses at each installation and narrowed the number of installations and courses for consideration.

**Course parameters.** Based on information in the literature on tailoring training in conjunction with professional judgment and knowledge of how Army courses are conducted, we narrowed the list of course parameters to eight, defined them, and developed expectations regarding their relationship to tailored training. Another goal was to identify parameters that could be evaluated using information available through public sources. The parameters were objective in nature and generally quantifiable, and they reflected dimensions not under the control of the instructor. The initial parameters, our expectations, and considerations regarding the relationship of the parameter to tailored training are in Table 1.

Table 1
*Course Parameters Used to Select Courses and Expectations Regarding Tailoring Training*

| |
|---|
| Instructor-to-Student Ratio |
| *Expectation*: The greater the instructor-to-student (total number of students in a course) ratio (e.g., 1: 5 is a higher ratio of instructors to students than 1: 20), the greater the likelihood the instructor can adjust training approaches to student differences.<br>*Considerations:* Some courses with large numbers of students could be taught in small groups, so course size is only a general indicator. Also courses taught by committee would be less likely to tailor since instructors would not be aware of relevant individual differences prior to training sessions. |
| Course Length (topic/subject) |
| *Expectation:* Longer courses will generally provide more opportunities to tailor training.<br>*Considerations:* The more time the instructor has to assess student performance and needs, the greater the opportunity to tailor training. Even though a course might be long, courses are generally broken into blocks of training. An entire course might not tailor training, but selected topics/subjects could be tailored. Also, a course that trains a single specific subject for 1 to 2 weeks could be more tailored than a course lasting several weeks that has numerous blocks of training on different subjects. |
| Graduation Requirement |
| *Expectation:* Courses with clearly defined and measureable performance standards will be more likely to have tailoring than courses which provide "familiarization" training.<br>*Considerations:* Courses with "familiarization" training and general subject areas do not typically establish rigid, measurable graduation requirements. On the other hand, courses that award an "additional skill identifier (ASI)" usually have clearly defined and measurable performance standards that must be achieved in order for each student to successfully complete the course. Instructors in ASI-producing courses will generally provide additional assistance to students who might have difficulty in a specific topic to ensure they can complete the course. |

And courses with clearly defined standards for course completion, even those that are not ASI-producing, will typically provide additional assistance or tailor training to students' needs, especially in areas where achieving standards is difficult. [ASIs show additional skills, training, and qualification Soldiers may possess, in addition to their MOS.]

Multiple Military Occupational Specialties (MOSs)

*Expectation*: In general, courses with students from heterogeneous military backgrounds will be more likely to tailor training in order to accommodate these differences.
*Considerations:* Personnel from varied MOSs and branches will enter a course with differing backgrounds. Although the likelihood of tailoring could increase as the number of MOSs increases, if the number is too large, tailoring might not be feasible. The assumption was that the likelihood of tailoring would decrease once the number of MOSs/branches was greater than six.

Number of Prerequisites

*Expectation:* Tailoring will be more likely in courses with few prerequisites than in courses with many prerequisites.
*Considerations:* If many course prerequisites are established, the likelihood of tailored training might be lower because the knowledge base of the student population has been "stabilized," thereby reducing individual differences. If few prerequisites are required, the knowledge and experience base of the students can be quite varied, thereby requiring tailoring to adapt to these differences.

Defined Proficiency Level at Graduation

*Expectation:* The higher the required proficiency level at graduation, the more likely training will be tailored.
*Considerations:* For courses where the graduate is expected to be at a "very high" proficiency level at course completion, instructors would be more inclined to provide focused assistance to "students with potential" who might be having some difficulty in certain topics/subjects. Courses with "master" in the title (or something similar) (e.g., Master Gunner, Jump Master) would be more likely to tailor training to ensure proficiency is attained. These courses generally have clearly defined graduation requirements that must be attained.

Multiple Locations

*Expectation:* Courses taught at multiple locations will be more likely to tailor training than courses taught at a single installation.
*Considerations:* The variations in supervisors, instructors, Soldiers, and course conditions at different installations could increase the likelihood of tailoring.

Availability of Major Assets

*Expectation:* The more favorable ratio of students to major assets (1 to 1 versus 1 to 20) in a course, the more likely tailoring will occur.
*Considerations:* In an equipment-oriented or computer course, the number of systems or computers available will impact how the training can be conducted. If each student has a system, an instructor can focus attention and tailor specifics to each student. But if limited assets are available, several students must share, and training cannot be tailored to each student.

**Installation considerations.** Initially, we considered collecting data from courses at ten installations. Seven installations were the location for U.S. Army Training and Doctrine Command (TRADOC) schools and three were primarily unit installations. Four of the TRADOC installations included multiple schools and training agencies. While the NCO academies at the unit installations conduct the Warrior Leader Course just as at TRADOC installations, they do

not conduct other TRADOC schoolhouse courses. However, the unit installations each conduct a variety of unit support courses designed to meet the needs of units on the installation. Some examples include driver training courses, combat lifesaver, and safety-oriented courses. The intent was to examine a variety of courses from different installations with a high likelihood of conducting tailored training.

For each of the ten installations, we accessed the ATRRS database to identify the courses at an installation. The number of courses at these installations ranged from 35 to more than 200, with a total of nearly 1,400 courses. In addition to the course title and number, ATRRS contains some detailed information for each course. This information includes the course schedule, the class size (maximum, optimum, and minimum), length of the course, scope of training covered in the course, and course prerequisites which generally identify who can attend the course (e.g., which MOSs, possibly different services besides Army, rank requirements).

Using the ATRRS information, we limited the number of potential courses for consideration, which in turn limited the number of installations. We did not consider the gamut of Initial Entry Training courses such as Basic Combat Training, Advanced Individual Training, and One Station Unit Training. These courses are the first training Soldiers receive upon entering the Army and the intent is to ensure all individuals achieve a minimum proficiency level of the requisite skills. Hence, the likelihood of having tailored training was expected to be low. We also eliminated courses that were offered infrequently, courses offered to only select populations such as the reserve component, and courses that were only offered in a distance learning mode, as the likelihood of tailoring training in these courses was perceived as being low or as providing limited opportunities to interview instructors.

Using the refined listing of courses, we reduced the number of installations for consideration. We identified the six TRADOC installations and one unit installation with relatively large numbers of potentially relevant courses.

**Final Phase: Selecting Installations and Courses**

To make the final selection of installations and courses, we established a rating scale for each course parameter. We then rated the courses to determine which installations had the greatest number of courses with a high likelihood of tailoring training.

**Parameter rating scales.** As the purpose of the parameter ratings was to establish an overall rank for the courses regarding the likelihood of conducting tailored training, the rating scales were not absolute determinants of tailoring. We developed a six-point rating scale for each parameter. The rating scale varied from zero, meaning a low likelihood of tailored training, to five, meaning a high likelihood of tailored training. The rating scales are in Table 2. As shown in Table 2, some rating scale values could not be defined for selected parameters since the information in ATRRS was limited. This was not considered a problem at the course selection phase since the overall intent was to rank order courses by the likelihood of tailored training, not to provide absolute measures of tailoring.

Table 2
*Rating Scales for Course Parameters*

| Parameter | Likelihood of Tailoring Training<br>Low Rating High | | | | | |
|---|---|---|---|---|---|---|
| | **0** | **1** | **2** | **3** | **4** | **5** |
| Instructor-to-Student Ratio[a] | 1:41 or more | 1:31 to 1:40 | 1:21 to 1:30 | 1:15 to 1:20 | 1:11 to 1:14 | 1:10 or less |
| Course Length | < 1 week | 1 week | 2 weeks | 3 weeks | 4 weeks | 5 weeks |
| Graduation Requirement | Familiarization only | -- | Written Tests | -- | Hands-on Tests | ASI, Safety, High-Value |
| Multiple MOSs [a] | 1 | 2<br>10+ | 3<br>9 | 4<br>8 | 5<br>7 | 6 |
| Number of Prerequisites | = or > 3 | -- | -- | 2 | -- | < 2 |
| Defined Proficiency Level at Graduation | No test | -- | -- | Written Tests | Hands-on Technical %/or Written Tests | ASI, Safety, High-Value |
| Multiple Locations | 1 | -- | 2 | 3 | 4 | 5 |
| Availability of Major Assets[b] | 1:5 or greater | 1:4 | -- | 1:3 | 1:2 | 1:1 |

*Note:* "--" in the table indicates a description/rating was not assigned to a particular scale point on the parameter.
[a] Per Table 1, we expected tailoring to be less feasible as the number of MOSs increased.
[b] Not available for rating courses for course selection.

**Assigning course ratings.** Using the parameter ratings in Table 2 and ATRRS information, we rated each of the courses at the six TRADOC installations. While the ATRRS database contains much useful information, it did not include sufficient information to rate every course parameter. Since not all needed information was available in ATRRS, we used a variety of techniques to complete as many ratings as possible. For example, in some cases we called an installation or course manager to request information. In other cases we applied judgment based on our knowledge of Army courses. For example, NCO professional development courses conducted at the NCO academies such as the Advanced and Senior Leaders Courses are conducted using the small-group instructor model. Therefore, we could assign a rating for an instructor to student ratio that reflected the small-group instruction mode with a typical instructor-to-student ratio of 1:15.

While the rating categories for "graduation requirement" and "defined proficiency level" are very similar (see Table 2), the meanings differed and the ratings were applied accordingly per each parameter. Since ATRRS does not provide details on course tests and graduation requirements, knowledge of Army courses was used to rate these course parameters. Based on military experience, we knew which courses were likely to have a "graduation requirement." In

addition, we knew that ASI-producing courses and courses involving high-dollar value equipment had well-defined and enforced graduation requirements. Also, courses requiring a student to demonstrate hands-on skills have established tasks and standards to be achieved for graduation. For "proficiency level," we knew that students completing an ASI-producing course, or courses where students would be responsible for high-dollar value equipment or for ensuring Soldier safety in dangerous situations, would be required to attain a high level of proficiency prior to graduation. These students would have to demonstrate a high level of proficiency and knowledge through various testing procedures. When only written tests are used, the proficiency level is often set at 70%, whereas with hands-on tests, the proficiency level is typically higher. Therefore, while the ratings in Table 2 might appear similar, they were applied differently for the two parameters.

While assigning as many ratings as possible, we recognized that two course parameters, as defined in Table 1, could not be appropriately rated for many courses due to lack of information in ATRRS. "Instructor-to-Student Ratio" could not be determined. The number of students for each course (maximum, optimum, and minimum) was available in ATRRS, however, the number of instructors available to conduct the training was not. Likewise, since the number of major systems, computers, and other assets was not available, "Availability of Major Assets" could not be determined for most courses. These two course parameters were eliminated from the rating process for course selection. To support making a final selection, we used the remaining six course parameter scales from Table 2 to rate 304 courses spread across the six TRADOC installations.

**Selection of the final installations and courses.** The ratings on the six parameters were summed to obtain the total points for each of the 304 courses in the six TRADOC installations. Based on the total points, the courses were rank ordered according to the likelihood that tailored training might be conducted. A total of 92 courses received 18 or more points (from a maximum of 36 points), and these courses were considered to be the most likely to conduct tailored training. Using the relative rankings, the three TRADOC installations that offered the greatest number of courses with a high likelihood of conducting tailored training were selected. Then the courses at these installations receiving 18 or more points were selected. At the unit installation, a mix of unit training courses and school courses that scored high on the rating scales was selected.

The final sample included 51 courses spread across four installations. The number of courses per installation ranged from 10 to 15. A summary of the selection process is illustrated in Figure 1.

Two other means of classifying the selected courses were applied. One factor was the type of training course. According to TRADOC Regulation 350-70 (Department of the Army [DA], 1999), there are five types of individual training courses. The varying types of courses are not mutually exclusive and their purposes are described as:

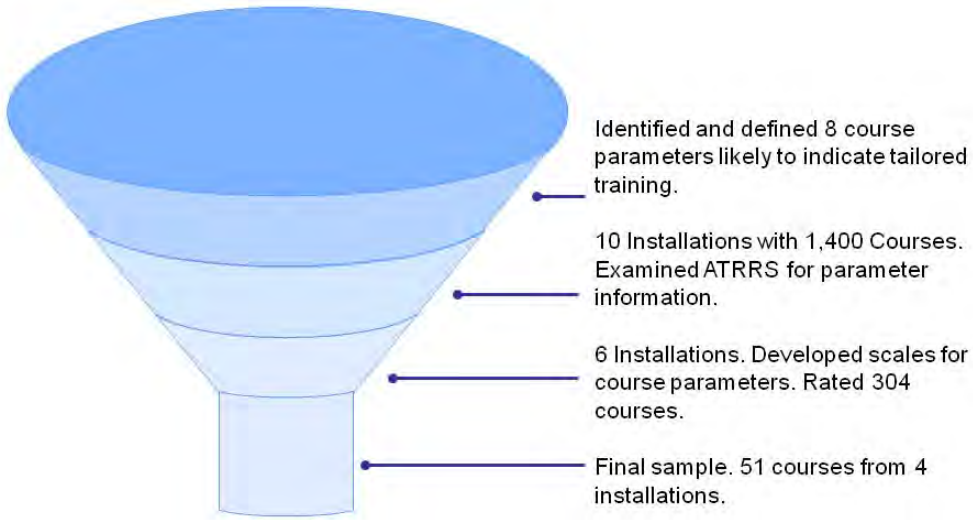


*Figure 1*. Summary of the installation and course selection process.

- Professional development - courses required by DA for branch (officer) / MOS (enlisted) qualification.
- Functional - prepare students for a duty assignment or position which requires specific functional skills and knowledge.
- General purpose - provide generic training (i.e., generic skill and knowledge) as the foundation for instructing specific tasks in other courses.
- Refresher/sustainment - provide either refresher or sustainment training when a specific level of proficiency is required; courses are designed for a specific MOS skill level.
- Self development - provide refresher/sustainment training in skills required for individual critical task performance; purpose is to prepare individuals to perform effectively in assignments of progressively greater responsibility.

The courses examined in this research were either professional development or functional.

We also considered the primary skills to be acquired during the course. We identified two major types:

- Technical - when the course purpose was to prepare the student to perform a "hands-on" function, such as the skill to operate or maintain a system, etc.
- Cognitive - when the primary course emphasis was on preparing the student to plan, think, and solve problems; the student could employ technologies to assist, but the student was not necessarily trained as an operator of the technology.

## Individuals Interviewed

Each organization selected the individuals to be interviewed based on a request for experienced instructors or course managers. Of the 81 individuals interviewed, the majority (96%) served as course instructors. A small number of course managers (11) participated and most of them (8) performed a dual role of course manager and instructor.[4] Only for one course did training developers participate in lieu of instructors. Common traits included a thorough familiarity with course content, routine classroom activities, and course requirements. Instructors were aware of how classes were conducted, the flexibility allowed in conducting the class, and how students typically responded to various techniques, methods and means of conducting classes.

Enlisted instructors (64%) ranged from Staff Sergeant to Master Sergeant and officers (5%) ranged from Captain to Lieutenant Colonel. Some individuals interviewed were Army civilians (20%) as well as contractors (10%); many of these personnel had retired from the Army, and had served as instructors while on active duty.

No formal data were obtained on the length of time each individual had been an instructor. However, informal comments made during the interviews indicated that times varied from a couple months to several years. Those with a short period of time as instructors were generally a recent course graduate, or had served as an instructor in a related course.

## Interview Procedures

The purpose of the interviews was to identify the ways instructors adapt or modify their training in order to accommodate differences in students. Three researchers conducted the interviews, with a single interviewer at three installations and two interviewers at the fourth. Interview sessions lasted between 45 minutes and 2 hours; on average, a session lasted about an hour. Each session was conducted with instructors/course managers from a single course. Most sessions (88%) had one or two instructors and no session had more than four.

The interview protocol is at Appendix B. First, instructors reviewed and updated, as necessary, the ATRRS data on course parameters. They were then asked if individual differences in the students mattered in the course. If so, we then explored when and how they determined if differences existed (including prerequisites, combat deployments, and other military experiences and duty assignments), and how they tailored their training to accommodate these differences. If instructors recognized the existence of individual differences, but did not tailor training, we determined what factors influenced this decision. The final phase of the interview focused on performance standards and measures of student proficiency.

Given the substantial differences among the courses under consideration, we anticipated a variety of responses to the questions. Most questions included multiple parts that could be asked, depending on the instructor's initial response. In addition, we included probing questions to clarify responses and gain more details. For example, if a combat deployment did not impact

[4] Because the majority of the individuals interviewed served as instructors, not course managers, the phrase "instructors" is used in the remainder of the report to refer to all participants.

student performance, we wanted to know why. If some prior experience did have an impact, we inquired about the extent of the impact on student performance. Probes included such items as whether instructors with more experienced students enabled these students to share their prior experience with others, and if so, how is this done (e.g., small-group breakouts, experienced students present some training). Questions also addressed the major types of tailoring in the research literature.

If instructors recognized the existence of individual differences, but did not adapt training, we attempted to determine what factors prevented adapting the training or caused the instructor to choose not to adapt. The intent was to identify potential impediments that, if alleviated or overcome, could increase the likelihood of tailoring training to better accommodate student learning.

Direct observation of the courses to validate information on the extent and types of tailored training was not possible. Some interview questions addressed whether training adaptations implemented in the course were successful or effective. However, responses were the instructors' opinions and no formal measurement of the impact of the tailoring was attempted.

Updated ATRRS information obtained during the interviews served as the basis for refining the course parameter definitions. Following all interviews, researchers reexamined and revised the course parameters and rating scales.

## Results

### Variety of Courses Examined

As the intent was to gather information from courses where we anticipated training was tailored to meet student needs, the selected courses were not a representative cross-section of Army courses. Of these courses, 71% were functional, and 29% were professional development (primarily NCO courses). As for the breakdown between technical and cognitive focus, 14 (27%) of the courses taught primarily technical skills, whereas 12 (24%) taught primarily cognitive skills. Nearly half (49%) the courses integrated a mix of technical and cognitive skill sets. For example, a "Master Gunner" course is a mix because the student must be an expert at disassembly and maintenance of the weapon system (technical, hands-on), in addition to being an expert at planning and developing training programs for the unit (cognitive). Likewise many NCO Education System courses, but not all, are a mix since they require the student to actually operate a piece of equipment or system as well as to learn how to perform administrative duties.

Table 3 shows the number of courses by student population, class size, and course length. Course populations included students from most Army ranks. Some were for enlisted personnel only, others were only for officers or NCOs, and some courses included a mix of students. About 30% of the courses allowed government civilians, other services, and foreign nationals to attend, but each of these categories of personnel was not represented in every class. In the selection process, we generally targeted courses with a greater variety in the student population since we assumed this would increase the likelihood of tailoring training. The actual class

population for our sample of courses generally varied from private first class (PFC) to sergeant first class for enlisted personnel, and officers usually varied from second lieutenant to major. Some courses did include higher ranking enlisted as well as officer students.

Table 3
*Number of Courses by Student Population, Class Size, and Course Length*

| | Student Population | | | | |
|---|---|---|---|---|---|
| | **PFC thru NCOs** | **NCO Only** | **Officer Only** | **Enlisted & Officer** | **Total** |
| **Total # of Courses** | 11 | 17[a] | 8[b] | 15[c] | 51 |
| **Class Size** | | | | | |
| Less than 5 | -- | -- | -- | 2 | 2 |
| 6 to 30 | 7 | 13 | 6 | 7 | 33 |
| 31 to 60 | 2 | 4 | 1 | 2 | 9 |
| More than 60 | 2 | -- | 1 | 4 | 7 |
| **Course Length** | | | | | |
| 1 week | -- | 1 | -- | 4 | 5 |
| 2 to 4 weeks (month) | 4 | 3 | 2 | 9 | 18 |
| 5 to 12 weeks (2 to 3 months) | 1 | 14 | 2 | -- | 17 |
| Longer than 12 weeks, and less than a year | 1 | -- | 4 | 1 | 6 |
| 1 year or longer | 5 | -- | -- | -- | 5 |

[a] 3 courses allowed civilians, other services, or foreign nationals.
[b] 3 courses allowed civilians, other services, or foreign nationals.
[c] 10 courses allowed civilians, other services, or foreign nationals.

Information from the instructors indicated the typical number of students attending the courses varied from less than 5 to more than 100 per class. The majority of the courses (69%) had 30 or fewer students per class. Only a few courses (14%) had more than 60 students. The courses with a higher number of students were usually divided into sections or small groups for most, if not all, training periods to enhance the instructor-to-student ratio.

Courses examined varied from one week in length to more than a year. Instsructor comments confirmed that longer courses consisted of multiple blocks of training, with each block of varying duration.

### Types of Tailored Training Identified in Courses

**Overview.** Although some types of tailored training examined in the behavioral science literature were implemented in the Army courses examined, they were not clear-cut instances of a given type and instructors often used more than one type. Consequently it was not possible to definitively categorize courses by either the type or the extent of tailored training. Also it was clear that the reasons for tailoring and the approaches used by the instructors varied with the student population, course requirements, course environment, and instructor capabilities.

One important finding was that some of the major types of tailored training did not occur in the sample. No instructor indicated that a formal pretest was given to divide students by ability, experience, and/or prior knowledge with instruction adapted to these differences. Nor were formal pretests used to identify individuals with weak backgrounds or knowledge, followed by some form of remedial training. In a limited number of courses, formal pretests were given to determine where more time or focus should be in the course. Instructors would informally assess students based on rank, prior experience, combat badges, or oral "biographies" in order to provide more attention to those with less experience.

In addition, no instructor indicated that some form of self-pacing was used or that the time to take a course or parts of a course was condensed for talented students. No intelligent tutoring systems were in place. Rarely did instructors indicate they deliberately modified their instruction (e.g., low or high structure) to different subgroups because of differences in prior knowledge or in accordance with the student's progression in the course.

Based on instructor comments, some courses or course phases approximated human tutoring conditions. Clearly microadaptation occurred, but it was not possible to delineate the extent or character of microadaptation from the interviews. Use of small groups for collective problem-solving and/or planning was common. In addition, there were variations of tailoring which did not fit the classical types cited in the research literature.

The next sections present some specific examples of the forms of tailored training reported by the instructors. Several caveats are necessary regarding these forms of tailoring. As tailored training can exist along a microadaptation to macroadaptation continuum, the distinctions among the types of tailoring made on the basis of the interviews were, in some cases, somewhat arbitrary. The examples cited are simply examples. They depict tailored training that occurred in one or two or three courses, not a majority of courses. Therefore, generalizations regarding the implementation of specific tailoring techniques to a broad spectrum of the courses in the sample are not warranted. In addition, in some cases we deviated from the names in the tailored training literature to better depict the variations that occurred. Appendix C provides additional tailored training examples gleaned from the interviews.

**Variations of human tutoring.** In some instances, the instruction in a course or a section of a course very closely approximated tutoring. Although there was no specific designation of a person to serve as an individual tutor, in a few cases, courses were broken into small groups throughout the course where instructors were assigned to and trained specific groups of about four students, tests were given regularly to formally assess individual proficiency, and retraining was conducted if students failed a test. In some instances, tests included items examining knowledge/skills taught earlier in the course.

In other instances, phases of courses went to a one-on-one instructional format when students acquired critical individual, often hands-on, skills. For example, where students served as a small unit leader during field exercises, an instructor would walk beside the student serving in the leadership role. This allowed the instructor to observe, coach, and assess performance during the exercise.

In some courses, each student had multiple opportunities to individually perform a task. An instructor would be assigned to observe a small number of students during these training periods. The instructor would typically move from student-to-student, personally observing performance and providing immediate feedback, guidance, and assistance, as appropriate.

Instructors provided many examples of assisting students who needed additional help or remedial training. However, we considered this to be microadaptation, not tutoring, as we used the concept of tutoring to reflect pre-planned activities, not activities which were primarily immediate responses or reactions to students' requests and needs.

**Use of small groups.** In some courses, students were organized into small groups for selected training events, practical exercises, and projects, which varied based on the block of training. Groups typically consisted of two to five students. It was not possible to verify the extent to which tailored training, as defined in the first section of this report, was implemented in such groups, although students had different experiences. But clearly, this mode of training was not large-group, lecture-based. Depending on the course, small groups served three quite different objectives.

*Group objective*. In some courses, the objective was to provide increased access to training aids, equipment, or training materials. Here, the primary intention was to give more students more first-hand experiences with equipment or with a situation in order to increase their skill on individual tasks.

In other courses, the objective was for groups to work on collective, often complex problem-solving type tasks or exercises that required students to function as a team. The following paragraphs illustrate the two major group training settings that involved collective tasks. Clearly they reflect complex situations which focused on a variety of cognitive as well as interpersonal coordination skills.

One objective was to have students work on multiple-solution type tasks such as producing a complex plan where there was more than one feasible solution. In some cases, the group was to produce a single output that was the collective effort of the entire group. In other instances, each student in the group was assigned a specific role. While the group was required to function as a collective entity in order for each student to accomplish the assigned part or role, the final output was actually attributable to each person's role.

The other objective of groups was to have students participate in exercises that placed them in positions similar to those they could hold after graduation. Here, grouping required students to perform as a team or staff member or for individual students to accomplish tasks, perform operations, conduct planning, or make estimates as they would in duties after course graduation. In some exercises, the other students were assigned duties and responsibilities to provide supporting roles, including but not limited to role play of supporting staffs, adjacent units, support units, higher headquarters, or subordinate element leaders. In one course, students were not permitted to be assigned duties associated with their Armed Service, requiring them to research the capabilities of sister services and joint units and staffs. Supporting roles added realism to the exercise, as role players provided or received information and performed

associated tasks to demonstrate impact on the primary task or team. This allowed the group to gain an understanding and appreciation of the interrelationships and requirements for coordination with products received from or provided to the primary players. Generally course instructors indicated that duties were rotated among students from exercise to exercise. This technique permitted all students with opportunities to practice aspects of their primary responsibilities and duties, as well as gain first-hand knowledge in related tasks and skills through supporting roles.

*Group composition*. In addition to using the group process for different training objectives, the means for determining the group composition varied as well as how the group outcome or product was presented or delivered. In some instances, assignment to a group was by convenience; no systematic means was used. Other courses used specific techniques to create groups. The most common method was to organize so each group would have one of the students with a high level of experience/skill in the subject area. This allowed the more experienced/skilled person to provide peer-to-peer assistance in the group.

Another group composition technique was to organize the students so disparate experience/skills were uniformly distributed throughout the groups. For example, when a course consisted of students with varied MOSs or specialty areas (e.g., heavy force / light force assignments), the intent was to ensure that each group had a cross-section of these backgrounds.

Some groups were organized based on the anticipated requirements of the student upon course completion. For example, when students with an assortment of ranks (e.g., junior enlisted to field grade officer) attended a single course, the groups could be organized so each rank group was represented in a group. The intent was for each person to accomplish the portion of the task or exercise that he/she would be expected to accomplish after graduation (e.g., officers conduct higher level planning, NCOs assist with planning and supervise while junior personnel accomplish duties of operating systems to support the planning).

One instructor used assigned seating to facilitate grouping. Group composition varied by training event or practical exercise. The groups were composed and recomposed based on the intent of the exercise to make the specific expertise or strengths of a student or students available within a specified group. However, significant relocation within the classroom was not required since students were seated in a manner that allowed the groups to be easily recomposed.

*Cooperative, collaborative and competitive groups*. Lastly, instructors indicated that grouping for collective task problems was implemented for cooperation, collaboration, or competition purposes as cited in the literature (Dillenbourg et al., 1996; Shute et al., 2000). Grouping in the courses we examined clearly involved at least one of these purposes, except when the groups were formed merely to allow more first-hand experience with limited training aids, equipment, or training materials. In some instances, groups were organized for multiple purposes.

The following example demonstrates how grouping was used for cooperation, collaboration, and competition purposes within the same, phased training event. First, students were assigned to groups and were required to *cooperate* to complete a complex task or problem.

Each member of the group had a designated part of the larger task to complete individually. For example, one person might develop the plumbing requirements for a facility, while another determined the electrical requirements, while another examined the structural feasibility for the location and intended purpose of facility. Once the individual parts were completed and assessed by an instructor, the group *collaborated* by combining the various parts and sharing ideas. They worked together as a team to modify the final product plan so that it represented the best ideas from each part and all parts melded into a single integrated product that met all functional requirements. Finally, each group presented its product plan for review and questions by other groups and the instructor. Each group was scored on the overall product plan, according to criteria specified by the instructor. The group with the "best" product plan according to the scoring criteria would win the *competition* and receive recognition.

**Examples of remediation.** While examples of one-on-one training were identified in several courses as a primary mode of tailoring, the preponderance of this one-on-one time was for remedial training following a test failure and to assist the student in preparing for a retest. Many of the instances described by instructors could be considered forms of microadaptation. Instructors from practically every course interviewed where testing was incorporated stated they provided one-on-one assistance to students who failed a test. Such assistance generally occurred at the request of the student. It was not deliberately planned by the instructor to meet student needs or to challenge more advanced students. Almost all instructors also stated they made themselves available to individual students outside of the classroom (after normal class hours) if a student requested assistance. However, most instructors said it did not happen because students typically did not fail tests or they did not request outside assistance.

Remedial assistance occurred in many forms. In one course, if a student failed the initial land navigation exercise, an instructor would follow the student on a practice exercise to observe and critique actions, providing tips and corrective actions on-the-spot. In another approach, an instructor would provide a task to a single individual to perform while a group of students observed. The instructor would focus on assisting that single individual, while other students benefited from the experience. There were instances where every student had an opportunity to perform a task in front of the group but time constraints did not always allow for this. Yet a different approach had an assistant instructor take a struggling student aside for one-on-one training while the class or group of students practiced tasks under the supervision of the primary instructor. In some courses the instructor would assign students to specific duty positions within a group. When observing the group, the instructor would focus on the weak student who was assigned to a specific duty position in which the student was weak, in order to help that individual learn and improve performance.

**Peer-to-peer instruction.** Some instructional strategies described by the instructors used peers to assist students who had difficulties. For example, when an instructor identified a student who was having difficulty performing the assigned task, the instructor would place that student in a leadership position. To assist and support that weak student, the instructor would often assign a strong student as a subordinate leader so the strong person could assist the weaker person. This technique was effective when team work was required to ensure course completion, so the stronger student was motivated to assist the weaker student.

Instructors stated that group assignments often involved this peer-to-peer consideration. Strong students would be distributed across the groups so they could assist the weaker students within the groups. A related technique was to use strong performers who had demonstrated their skill in an area to serve as assistant instructors while training a subject area or block of training.

However, peer coaching was discouraged in some courses due to concerns about students learning improper techniques. This would occur in very technical courses and courses involving the safety of life or equipment.

**Varying exercise and task difficulty.** Although instructors did not use formal assessments to determine initial strengths and weaknesses at the start of courses, they often evaluated students during the course and used these assessments to modify the difficulty of exercises or applied techniques to challenge the "stronger" students. Thus some instructors had a strategy for adapting to the more capable students, but simply did not know initially to whom the strategy might apply. The following paragraphs summarize some examples provided in the interviews.

Instructors indicated they assigned the stronger, more experienced and capable students the more challenging tasks and duty positions within a group. This would require the more capable student to perform at a higher skill level. Likewise, when all students were to be assessed on similar tasks, the instructor assigned the initial evaluations to the stronger students. This allowed the more capable students to set the example and weaker students more opportunities to observe correct performance prior to being evaluated.

For training events and practical exercises, instructors would gradually reduce the time available to accomplish an assigned task to increase stress and improve proficiency level, with the time reduction and frequency of changing the conditions dependent on each individual student's performance. A similar technique was to increase the level of accuracy required for acceptable task performance. For example, an instructor might initially allow a student to have a 10% variance from the optimal system adjustment and then as student proficiency increased, reduce the allowable variance.

Another means of challenging students was to tailor practical exercise conditions and requirements for individual students based on assessment of the student's capabilities in the learning process. Some examples of how this was done include: interjecting more and different threats to the friendly force; imposing more limitations on assets; increasing the risk of mission accomplishment, due to more complex environmental changes; or allowing students less time to prepare for the mission. Instructors would change an assigned mission on very short notice, explaining that this was based on an emerging "world condition change." These variations were realistic and forced a student to quickly adapt, change focus, and still be ready to respond. Instructors would also introduce "what-if" contingencies during exercises and events that caused a student to consider a new situation. In addition to varying exercise conditions, instructors could also provide additional exercises with a higher level of difficulty to stronger students who completed regular exercises rapidly.

Some students started a course having prior experience or a high level of skill in selected topic areas. Instructors typically identified these students from information contained in the students' start-of-course introductory biographies. In some cases, instructors would have the student develop and/or present a block of training in this strong area. Other students had the opportunity to learn the material, as well as ask questions and/or critique the presentation. Instructors stated this technique motivated the experienced students and challenged other students to attain a higher level of proficiency or depth of knowledge.

Instructors indicated that students routinely identified problems or asked questions about situations they had encountered or might encounter in their future duty assignment. Examples cited include: how to assist a Soldier in handling a pay problem; counseling a Soldier for various infractions, including potential remedial actions and punishments that could be successful in correcting Soldier behavior or performance; or requirements for recommending a subordinate for appearance at a promotion board. Rather than merely providing an answer to the student, the instructor would require the student to conduct research on how to resolve the situation then prepare the necessary paperwork and present research results to other students. This technique tailored the research requirement to an issue that was pertinent to the student, helped the student learn to find solutions with available assets, and share the knowledge that was acquired.

In some cases, instructors assigned students to positions outside of their area of strength or expertise. When an instructor assessed a weakness or area needing more proficiency, the student was given additional exercises or placed in a group leadership role for a training event. This requirement and higher level of responsibility increased student pressure and motivation to improve.

**Potential Indicators of Tailored Training – Refinement and Revision of Course Parameters**

One objective of the research was to identify indicators that could determine if a course was likely to have tailored training. The interview process clearly indicated that some of the original course parameter definitions and associated rating scales needed to be revised to appropriately reflect the nature of the courses. For example, although course prerequisites were cited in ATRRS, in some cases instructors indicated that prerequisites were waived or additional prerequisites were used in restricting course attendance. Also ATRRS information was not always current and not always enforced. Therefore, following the interviews, researchers reexamined the course parameters for validity in predicting the likelihood of tailored training. Some parameters were changed and minor modifications were made to others to more clearly define how the parameter related to the likelihood of tailored training. We were able to obtain data on the availability of major assets and instructor-to-student ratio parameters and to refine them. The revisions provided a better description of course parameters than did our general knowledge about certain types of courses based on ATRRS information. In addition, one parameter, multiple locations, was deleted as it did not occur frequently and therefore did not discriminate the courses.

The revised course parameter definitions and scales, plus the percentages of courses in each parameter category, are in Table 4. For each parameter, the ratings were reduced to three categories. As before, the categories were ordered to represent the perceived likelihood of

tailored training (low, medium, and high). It is important to stress that the relative percentage of courses in the different categories should not be construed to represent Army courses in general. As a reminder, we selected courses based on our initial assessment that they generally had a high likelihood of conducting tailored training, not to have a representative sample of all Army courses. The revisions indicate that using a public domain such as ATRRS will not accurately depict individual courses. Although satisfactory for sample selection purposes, ATRRS is not adequate for predicting which courses actually have tailoring or determining what type of tailoring occurs in a given course. The data in Table 4 do, however, provide a picture of the courses in the sample.

**Typical instructor-to-student ratio.** Interviews indicated that simply dividing the number of instructors by the number of students was not indicative of how most courses were conducted. A common method of conducting training was described. A single instructor might present an introductory session to all students, varying from 10 to 200 depending on the course. Following the relatively short introductory session, usually less than 5% of the time available for the block of training, students would be divided into groups to receive more detailed information and to participate in practical exercises. For some courses, each group might have a single, dedicated instructor, while the usual technique was to have an instructor oversee and support multiple groups. While for a short period of training time there might be an instructor-to-student ratio of 1:50 or more, the preponderance of the training time, was actually conducted at a much lower ratio of 1:20 or less.

Often, the number of instructors available varied with the content and demands of different blocks of training. For example, in one course the ratio varied from 1:1, to 1:5, to 1:17. In some courses the TRADOC small group standard of 1 instructor to 16 students was the norm, but even this ratio could vary for selected exercises conducted in groups of 2 to 5 students.

Thus a better approach for this parameter was to classify a course by the "typical" instructor-to-student ratio. Assessing the student-to-instructor ratio course parameter requires knowledge of how the course is conducted, which is not available in ATRRS. The final three rating categories ranged from 1 instructor to 21 or more students to 1 instructor for 10 or fewer students. As shown in Table 4, most courses were characterized by two instructor-to-student ratios --- 1:10 or fewer students and 1:20 to 1:11.

Of additional interest is whether class size related to tailoring. A breakdown of the courses most likely to tailor versus those less likely to tailor showed that both categories of courses had small class sizes, with at least 75% of the courses having 40 or fewer students (see Table D-1). However, the largest class sizes (100 students or more) were in courses where tailoring was less likely.

**Typical section/subject length.** While courses of short duration (e.g., a week or less) usually concentrate on a single subject, longer courses usually cover a variety of subjects. In fact, as stated by the instructors, longer courses were generally broken into multiple sections, subjects, or blocks of training. For example, from ATRRS, an NCO professional development course is usually four weeks or longer. However, instructors indicated that the courses consist of multiple subject areas (e.g., administrative subjects, weapons skills), with each typically varying

from a day to a week. As stated in the original parameter definition, even though the entire course might not offer tailored training, selected blocks of training could. To provide a more descriptive title, the parameter was modified from overall course length to "typical" section/subject length.

Table 4
*Revised Course Parameters and Percentage of Courses in Each Parameter Category*

| Parameter (categories ordered from low to high regarding potential for tailored training) | % Courses |
|---|---|
| Typical instructor-to-student ratio | |
| 1:21 or greater | 6 |
| 1:20 to 1:11 | 47 |
| 1:10 or less | 47 |
| Typical section/subject length | |
| Less than 1 week | 6 |
| 1-2 weeks | 37 |
| More than 2 weeks | 57 |
| Graduation requirement | |
| Loosely defined and not enforced | 6 |
| Defined, but loosely assessed and enforced or waived | 51 |
| Well-defined and strictly assessed and enforced | 43 |
| Homogeneity/heterogeneity of student population | |
| Single MOS, branch, or rank | 41 |
| 2-5 MOSs, branches, ranks, services | 18 |
| 6 or more MOSs, branches, ranks, services | 41 |
| # of enforced prerequisites | |
| 2 or less | 57 |
| 3 | 12 |
| More than 3 | 31 |
| Proficiency | |
| Basic – no test or assessment | 29 |
| Intermediate – written and/or hands-on test | 39 |
| Advanced – certification, demonstrated proficiency with complex tasks involving human safety, material safety or high dollar equipment | 31 |
| First-hand experience w/ equipment and/or duty position | |
| 5:1 or greater | 18 |
| 4:1 to 2:1 | 39 |
| 1:1 | 43 |

*Note.* $N = 51$.

As assumed with the original parameter, instructors confirmed that longer blocks of training provided more opportunities for student assessment and thus, increased the likelihood of tailored training. Very short blocks of training were usually tightly structured to ensure all required material was presented so there were limited opportunities for tailoring. On the other hand, when blocks of training extended beyond two weeks, instructors indicated they had

multiple exercises and events to observe and assess students, to interject variations into the training, and to better address individual student needs.

The revised rating scale had three categories for typical course length: less than one week, one to two weeks, and more than two weeks. The most frequent category was more than two weeks (57%, see Table 4).

**Graduation requirements.** While ATRRS has information on some courses concerning graduation requirements, information received during interviews indicated that assessment and enforcement of course requirements varied significantly from ATRRS. This parameter was changed slightly to better reflect the variation in graduation standards that were established and imposed, as described by the instructors (see Table 4).

As confirmed by instructors, courses that provided "familiarization" training were less likely to have tailored training. In the revised parameter, "familiarization" was replaced with the more descriptive explanation of the condition as "loosely defined requirements that are not enforced." This generally means that the requirements might be stated, but do not have clearly defined and measurable standards. Also, there is no regularly mandated assessment, neither subjective nor objective, to determine student knowledge or proficiency. For example, a course might require students to participate in a series of practical exercises then possibly develop and present a briefing. In these instances, a student could graduate by merely participating in the group events, regardless of individual contribution or performance.

The next category was redefined as "defined requirements, but loosely assessed and enforced or waived." Generally, this means that graduation requirements are stated in a manner that allows for assessment measurement. However, the requirements are not always evaluated, and in some cases when they are evaluated, the established standard can be waived. Instructors for courses rated in this category indicated there was flexibility in assessing student performance. Subjectivity by instructors and course managers was a key factor in determining if standards had been met.

The last category, and the one most likely to enable tailored training, was when a course had "well-defined requirements that are strictly assessed and enforced." As supported by instructor comments, courses that awarded an ASI had clearly defined measurable performance standards that had to be achieved to successfully complete the course. These courses frequently provided additional assistance to students who might have difficulty with specific topic/subject areas or provided supplemental training or materials to assure graduates could attain the established standard. Courses with clearly defined standards for course completion, even those that were not ASI-producing, would generally provide additional assistance to students, especially in the topics/subjects where achieving standards was difficult. These courses usually included those that trained lifesaving/preserving and safety skills, those that trained Soldiers who controlled/operated high-dollar, complex or dangerous (high-risk) systems, performed high visibility operations, or were of a high command level of interest. Less than half (43%) the courses fell in this category (see Table 4).

**Homogeneity/heterogeneity of the student population (# MOS/branch/service).** In the interviews, it was determined that the student population in a course could range from a single MOS/branch or rank to courses with multiple MOSs, officers and NCOs who could be of different ranks, civilians in some cases, and to individuals from other services in the Department of Defense. To be more descriptive and all-inclusive of the student population, the parameter was renamed from "multiple MOSs" to "homogeneity/heterogeneity of the student population."

The initial assumption was that with some variation in this area, instructors would need to tailor training to accommodate student differences. However, if great variations in MOSs, ranks, etc., occurred, tailored training might not be feasible. Instructors would have limited time and ability to adapt course material to meet individual needs of a very diverse student population. But the interviews seemed to indicate the opposite was the case, at least given the extent of heterogeneity in the sample of courses in the research. Courses with a large diversity in student population generally consisted of smaller class sizes (less than 50 students) and the diversity usually involved a relatively small number of students (e.g., less than 5 from other services, or different MOSs, but with similar prior operational experiences). Therefore, instructors typically had the opportunity to tailor training to meet individual student learning needs. In many instances, this involved ensuring that all students possessed the requisite background knowledge to adequately understand and learn the material covered in the course. A typical example of this was that students from other services needed to know Army doctrinal terms and operational concepts. Likewise, students frequently needed to understand the military decision-making process used by Army staff organizations. Instructors had materials available to assist these students either through self-learning or instructor assistance (e.g., outside of class hours with a few students).

Instructors also organized student groups so more experienced students were appropriately distributed to assist students with different MOSs and ranks or from other services. Overall, the more heterogeneous the student group, the more likely that training would be tailored.

As shown in Table 4, the two most frequent categories of courses for this parameter were a single MOS, branch, or rank (41%) and six or more MOSs, branches, ranks, services (41%). Thus most of the courses were at either the low or the high end of the rating scale.

**Number of enforced prerequisites.** The original category of "number of prerequisites" was redefined as "number of enforced prerequisites" as discussion with the instructors revealed that in some cases not all prerequisites cited in ATRRS were enforced. Additionally, instructors noted that in some cases more prerequisites had been added for a course, but were not recorded in ATRRS.

As with the original parameter, prerequisites excluded rank or grade, adherence to the Army's height and weight standards, passing the Army Physical Fitness Test, or possession of a current security clearance. Prerequisites that were considered did reflect such requirements as completion of prior courses or training sessions, achievement of a specified score in a selected area of the Armed Services Vocational Aptitude Battery (ASVAB), etc.

The revised parameter identified three distinct categories for the number of enforced prerequisites. However, contrary to the initial assumption, based on the interviews it appeared that courses with a higher number of enforced prerequisites were more likely to have tailored training than courses with fewer enforced prerequisites. Courses with more stringent prerequisites were generally for the more advanced courses. Students attending these courses were generally higher ranking personnel with longer time in service and more experience than courses with fewer prerequisites. Therefore, instructors tended to rely on the students themselves to share their knowledge and expertise with others, to seek special assistance in weak areas, to explore course information for application to their specific duty assignments, and to request supplemental material that might assist them in applying the course material. These more senior and experienced students were also open to and requested course tailoring. As indicated in Table 4, 31% of the courses were in the highest category of more than three enforced prerequisites.

**Proficiency level.** The proficiency level parameter was originally conceptualized in terms of how student proficiency was assessed, not the attained level of proficiency. Based on information provided by the instructors, the rating categories were redefined to reflect increasing levels of proficiency as opposed to types of tests in the original parameter definition (see Table 4).

The lowest rating, or no test category, was redefined as "basic" proficiency. This meant that students were not necessarily assessed through a formal evaluation process, and the assumption was made that students would possess the basic knowledge and skill intended for the course from participation in course training activities. Consequently, assessment of proficiency was usually based on participation in practical exercises, discussions, and class assignments, not a formal test protocol.

Written and/or hands-on tests were categorized as an "intermediate" level of proficiency. Per instructor comments, these assessments provided a general measure of student knowledge and skill. Student proficiency was assessed, but test items typically equated to a general level of performance and did not indicate a high level of proficiency.

Lastly, courses with an "advanced" level of proficiency (31%) required a certification (e.g., awarding an ASI), included assessments that demonstrated hands-on proficiency, or had a requirement to be proficient with complex tasks requiring a high level of proficiency. These courses usually involved human safety, material safety, or high-dollar equipment. From the interviews, it was clear that most instructors aimed to ensure students attained this advanced level of proficiency and therefore adapted training lessons, provided one-on-one assistance, and/or provided tailored materials to meet individual student needs.

**First-hand experience with equipment and/or duty position.** The last parameter was originally called "availability of major assets," but was revised to "first-hand experiences with equipment and/or duty position." Major assets referred to equipment and the ratio of that equipment to the students in the course, with one-to-one ratios of equipment to students assumed to allow more opportunities for the instructor to provide tailored training events and practical exercises. However, it was clear in the interviews that courses that did not involve equipment

employed a similar concept by separating students into groups to increase opportunities to tailor training events and practical exercises. The ratio of equipment assets to students was easily determined. The definitions used to discriminate "first-hand experiences" are described to clarify the revised parameter.

Often subgroups required individuals to serve in a specific duty position (e.g., simulating duty positions in a staff group). Instructors indicated that in some practical exercises there are key positions that provide practice of related skills and other positions in the exercise merely provide support. Rotation of these key positions within the subgroups in multiple exercises was expected to allow more opportunities for tailoring training and increased first-hand experiences. Therefore, the parameter was modified to acknowledge how grouping for exercises provided an increased potential for tailoring training.

At the low end of the rating scale, some exercises were targeted at a total group effort where the group of students produced a single output, with the output being reflective of the group. In these instances, the instructor would conduct this "first-hand" experience with the total group (e.g., frequently 5:1 or greater) and adapt training to that group as a whole. When the instructor merely examined the total group product or output, such as conducting an after action review of the total group effort, then the instructor would work with a group and not help a single student, but rather the entire group.

Other training events and exercises designated a specific role for each member of the group. For example, at the mid-range of the rating scale, the instructor divided students into groups of two to four. Students would typically divide the required tasks among themselves and frequently collaborated to ensure all required tasks were accomplished. While some students might have an assigned role in the group, the group still worked together to produce the output. This smaller group size of two to four allowed the instructor to better assess performance of smaller groups of students.

On the high end of the scale, groups might be three to four students, but each person within each group had an assigned duty position. Each group member accomplished the assigned responsibility and cooperated with other members to contribute to the overall product. So while the group had an overall task to accomplish, the instructor could actually work with a single student in a specific duty position who might need additional assistance. In these situations, the instructor had an opportunity to assess each student individually while performing a task or function and could provide feedback aimed at individual performance. Therefore, even though the training might be a group event or exercise, the instructor actually could provide "first-hand" interaction with each individual in the group, as well as the entire group. Assigning specific duty positions allowed an instructor to focus on a single student if and when appropriate. It also allowed more experienced students within the group, if present, to assist the weaker students.

Based on instructor comments, when training events and assessments were conducted that enabled feedback to an individual or a smaller group of students, tailored training was more likely. Therefore, the more often such training exercises and events were conducted in groups (whether for equipment training or training for specific roles or duty positions), the more likely

training could be adapted to student needs. Overall, the percentage of courses with one-to-one ratios of first-hand experiences was 43% (see Table 4).

**Additional Conditions That Could Indicate Courses With Tailored Training**

Following revision of the original course parameters, researchers examined information from the interviews to see if other conditions might indicate the existence of tailored training. The original parameters reflected course information from ATRRS and were relatively stable parameters. However, in the final analysis, some of the original course parameters were redefined based on updated information that was only accessible from the instructors (e.g., number of prerequisites, proficiency level) and in some cases under the instructor's control (e.g., first-hand experiences). This expanded look was to help determine if there were other factors that might indicate a high likelihood that instructors tailored training. These factors included the type of course, frequency of assessments, and supplemental materials.

**Type of course**. The type of course, functional or professional development, was found to be related to tailoring. Using the revised course parameters and rating scales, all courses were reevaluated and rank ordered based on their total rating. This total rating was used as an index of tailoring. Functional courses were far more likely to be high on this index of tailoring than NCO and officer professional development courses. Using the rank ordering of the courses, functional courses were at the top of this ordering: with 100% in the top one-third, 88% in the middle one-third, and 29% in the bottom one-third. If the two types of courses had been balanced regarding tailoring, then we would have expected a 70%/30% division of functional and professional development courses in each third.

**Frequency of assessments.** A basic assumption, based on the research literature, is that in order to tailor training to individual differences throughout a course, the extent of individual differences must be known. A primary means of knowing the extent of such differences is through assessments. Instructors provided detailed information on the frequency of assessments in their courses, which included quizzes, tests, short-oral presentations, structured checks-on-learning, and evaluated exercises.

It was possible to document the frequency of such assessments from the interviews. Courses that provided periodic tests, structured checks-on-learning with timely feedback, or frequent instructor assessments of student performance and learning tended to provide more tailored training. While informal in-class questions to selected students can be a positive indicator, we found that checks and assessments must include all students A further essential component was that instructors needed to provide timely feedback. In courses where quizzes, tests, and homework were not graded and returned, and where tests were only administered at the end of a block or section of training, there was a low probability of tailored training. Assessing student learning and progress more frequently was an indicator of a higher probability that instructors were focused on improving each student's skills and knowledge. This occurred in 53% of the courses (see Table 5).

Table 5
*Tailored Training Conditions and Percentage of Courses in Each Condition Category*

| Condition (categories ordered from low to high regarding potential for tailored training) | % Courses |
|---|---|
| Frequency of assessments with feedback | |
| End of block / section tests only | 25% |
| At least weekly or throughout blocks of training with feedback | 22% |
| Typically daily with feedback | 53% |
| Supplemental training materials | |
| None or only at course completion | 80% |
| For students who were failing or having difficulties | 6% |
| Materials to expand learning and skills | 14% |

*Note.* $N = 51$.

**Supplemental training materials.** The research literature indicates that tailoring is most effective when different modes of instruction are used as appropriate for different students. One way to enable this is to provide supplemental materials – either as remedial materials or as materials to challenge students. This information was also available from the interviews. Courses that provided additional study materials during the course to permit students to self-study, increase proficiency, or gain additional knowledge on a subject tended to provide more tailored training.

While all instructors indicated they provided additional training to students who failed tests prior to retest, some only reemphasized areas of difficulty, typically by re-presenting the training material already received in class. Only a few courses provided supplemental or additional study materials during the course for students who failed tests or expressed difficulties understanding some subjects (20%, see Table 5). Instructors in some of these courses directed students to outside resources, such as subject matter experts, for assistance or further study. Additionally, some courses provided materials, references, or websites to students upon completion of the course. Courses that integrated situations which encouraged or required students to research or use pertinent outside materials were likely to promote tailored training. Instructors indicated that students were more likely to ask questions or perform learning activities that broadened their learning and understanding of skills in those courses.

## Courses That Stressed Mastery of Course Material

It was clear from the interviews that a cluster of dimensions impacted attention to individual differences. Most notably, courses designed to insure students mastered the material or skills required in the course had distinctive training processes, some of which related, directly or indirectly, to some course parameters. Graduates of these courses were to be assigned positions of responsibility where individual competency would be critical. Six dimensions were identified that contributed to this emphasis on mastery. One dimension was whether a graduate received certification (e.g., awarded an ASI). A second was whether a graduate's skills impacted human life/safety or equipment safety, survivability, and/or reliability. Third was whether

graduates had to operate high-dollar systems. The fourth was whether graduates would be responsible for or were to operate complex or dangerous systems. Fifth was whether the graduates would work in high visibility operations (including supporting operations at high command levels). The last dimension was whether graduates would work in areas of high command interest with regard to current combat operations, which often entailed new systems.

Of the 51 courses, 23 (45%) reflected these dimensions to varying degrees and were therefore considered as ones that stressed mastery. Eleven were characterized by three dimensions, eleven by two dimensions, and one by a single dimension. All 23 courses also rated highest on the graduation requirement or proficiency parameter or both. However, the graduation requirement parameter (i.e., well-defined and strictly enforced and assessed requirement) characterized 96% of the courses. In addition, all courses were functional courses.

One hypothesis emerging from these findings is that the graduation requirement drives the training intensity, the degree of training toward mastery, and tailored training. To ensure every graduate is proficient, the instructors must attend to individual differences initially and throughout the course. This factor, more than the others examined, may have the greatest influence on whether tailored training is implemented.

**Impediments to Tailoring Training**

While our examination aimed at identifying tailored training in Army courses, we also recognized that certain factors seemed to prevail when instructors indicated training was not usually tailored. The situations and conditions presented in the following paragraphs apply to courses where instructors indicated that tailored training did not generally occur. In addition, information on the course parameters also provided other insights into possible impediments. Lack of tailored training in a course could be caused by one or more of these impediments.

Based on responses from instructors, more than half the courses enforced two or fewer prerequisites (see Table 4). Prerequisites were frequently waived or were not enforced. Since prerequisites might not exist or be enforced, the likelihood increases that students attend the course lacking essential entry-level knowledge, skills, and/or experiences. Therefore, instructors could be confronted with major variations among student abilities that could require significant tailoring to meet each student's needs. Coupled with the fact that prerequisites were not always enforced, no course which we examined conducted a systematic up-front assessment to determine individual student's entry-level proficiency. Hence, without knowing the status of students relative to the blocks of instruction in a course or whether differences warranted tailoring, instructors cannot tailor initially to meet student needs.

Instructors indicated that materials did not exist to conduct training tailored to different and specific student needs. Courses generally had an established program of instruction (POI) with designated lesson plans where course requirements and standards were stipulated. Only materials necessary to teach the basic course information had been developed and were available to instructors. If blocks of training were to be modified, it was incumbent upon the instructor to make the changes.

Most instructors in TRADOC schools are required or expected to attend an instructor training course prior to conducting training (Bickley et al., 2010). Yet the instructors indicated that although they were trained in the process of developing training materials, they were not trained in how to determine and develop materials to meet individual student needs. Nor were they trained on how to determine the most appropriate tailored training techniques for the student-subject matter combination in their courses or how to implement those techniques. Also, the instructors indicated that these courses typically did not address assessment procedures that can be used to determine critical individual differences at the start of and during a course that might warrant tailoring of some form. Further, since courses in our sample generally did not conduct pretests or up-front assessments, instructors did not know what training should be tailored to meet what needs. Instructors generally stated they followed the course lesson plans which did not address what and how to tailor to meet student needs.

Per information provided during interviews, even if instructors knew what training to modify and how to do it to meet student needs, there was an overall shortage of resources or individual opportunities to develop tailored training material or approaches. Many instructors stated they did not have time in their schedule to modify existing materials or to develop new materials. In many instances, instructors did not have access to other needed resources (e.g., technology assets, equipment, facilities) to appropriately tailor their training materials, since these assets were not provided as part of the course POI.

Course POIs generally stipulate the task standards which must be achieved to successfully complete a course. However, per many instructors, these standards were often ill-defined or nonexistent for some blocks of training, or were established for a very low level of performance. It appeared that when the course standards were relatively easy for students to attain, instructors did not sense the need to tailor training to increase a student's proficiency level. Some instructors determined that meeting the minimum standard was the course requirement and recognized they did not have the requisite resources to attempt to implement tailored training to assist students in surpassing the course standard.

Due to a variety of reasons stated by the instructors (e.g., operating tempo of the Army, shortage of instructors, insufficient time allotted to course), it seems many courses are mainly geared at ensuring the maximum number of graduates. That is, the concern is on the number or percentage of students who graduate vice that students attain the highest possible level of proficiency. An additional factor in this regard is that some courses focus on the "familiarization" of skills and presentation of information, rather than assessing student skill level, which is important in executing tailored training.

Another issue identified by the instructors was that training support assets were creating a situation where instructors felt compelled to train to time and not to a specified standard. Skill proficiency was not systematically assessed, nor objectively enforced for graduation. For some courses, training sessions were geared at fitting within an allowed time block so students could meet timelines for transportation or scheduled meals. If there was insufficient time during a scheduled block of training to ensure students achieved the specified level of proficiency, instructors did allot time to conduct remedial training to ensure students ultimately passed a required test.

Even when courses were conducted as a small group instruction method with approximately a 1:16 instructor-to-student ratio, instructors stated they did not have sufficient time allocated in the course to tailor training to individual students. Therefore, they typically focused on ensuring all students met the desired minimum level of proficiency.

Course POIs generally allow some flexibility in how classes are to be executed. However, per instructor responses, some organizations strictly enforced what training material was presented, how it was presented, and the allotted time. The purpose was to ensure standardization among the course instructors. These fixed course structures did not allow an instructor the latitude to implement tailored training. However, other instructors indicated that they had full latitude from their leadership and were encouraged to try new techniques and approaches to improve student learning. Another impediment across most courses is that there is generally no standardized means of sharing tailoring techniques/ideas and lessons learned among instructors.

Instructors indicated that some blocks of training and subjects within a course addressed specialized topics which were presented by only selected personnel or experts. These specialty personnel conducted training for different courses and frequently spent only one or two days with a course. Given the short period of time these specialty instructors spend with any course, they did not have an opportunity to learn critical individual differences and tailor training appropriately, and they typically presented a standard block of training.

## Discussion

After redefining the course parameters and rating the courses based on the revised parameters and categories, the courses were rank ordered. This provided a framework to compare and contrast groups of courses that were rated as highly likely to conduct tailored training and those where tailored training was rated low. We also examined the overall feedback from the interviews to identify some key factors that seemed to influence the existence and extent of tailoring training within a course.

When courses were rank ordered, certain factors became evident as predominant among the courses where instructor interviews indicated training was tailored. The factors for highly rated courses are described in the following paragraphs. Typically, courses with tailored training were rated highly on most all the major factors. It should also be noted that courses ranked low on the list for tailoring training could possess some of the same characteristics, but tailored training was not conducted due to a shortfall in other characteristics.

One caveat is in order. The relationships we found may not necessarily generalize to the population of Army courses as a whole. For example, in courses with a heterogeneous student population, the number of individuals contributing to that diversity was limited, which enabled instructors to address critical differences. But if the different MOSs or branches had been more equivalent in number, instructors may not have been able to tailor as easily or as well. Similar considerations could apply to enforced prerequisites. However, in reality, it may be that other

courses with many prerequisites are typically senior level courses where students expect a degree of tailoring to occur as was the case in our research sample.

**Characteristics of Courses Where Instructors Indicated They Tailored Training**

The course parameters and conditions we examined can be placed in the context of an input, process, and output/outcome model. The following paragraphs describe a cluster of six factors which appeared to be most strongly related to or impacted tailored training.

With respect to *input*, two course parameters, heterogeneity of the MOS/branch and number of enforced prerequisites, were important. Where training was tailored, typically a set of prerequisites was established and enforced for most courses, and the MOSs/branches tended to be diverse. The prerequisites defined the knowledge, skills, and experiences that students needed in order to be successful in the course. Students were vetted and checked to ensure all necessary achievement gates were met before entering the course. In some cases, students were earmarked for a specific follow-on duty position in order to attend the course. The attention to individual differences and competency reflected in the prerequisite requirements continued in the course itself. A heterogeneous student population led to more tailoring, as it was necessary to attend to differences in the students' backgrounds that impacted students' capability to progress in the course.

Regarding the *instructional process*, a favorable ratio of instructors to students for first-hand experiences or equipment training as well as frequent assessments were associated with tailoring. For courses ranked high on tailoring, student assessments were typically structured and conducted in a fashion that replicated or resembled how the task would be performed in a realistic situation. Student performance was generally assessed individually, often by both written tests of knowledge and hands-on skill demonstration. Assessments were conducted frequently and students received feedback so they could improve where needed. The instructor-to-student ratio was favorable for first-hand experiences when practical exercises and learning situations were conducted regularly in small groups or with each student alone. When executing these first-hand experiences in groups, multiple iterations of an exercise might be conducted to allow each student to experience the various facets of the task. When quantities of equipment tended to match the number of students, tailoring was facilitated.

Lastly, when the *outcome of the course* was to ensure graduates had the required skills, expertise, and knowledge, courses had well-defined and enforced graduation requirements leading to a high level of proficiency. As a result, instructors attended to individual differences to ensure graduates were very proficient. The preponderance of these courses were functional. It is worth noting that typically in these cases students who did not attain the required standard would be dismissed from the course. As a rule, these courses also required students to reach an advanced level of proficiency, generally requiring skill certification which could include demonstrated hands-on proficiency with complex tasks that involved human safety, material safety, or high dollar equipment.

In addition, for courses most likely to conduct tailored training, instructors generally had the latitude to determine methods and techniques for conducting their training. Managers and

supervisors supported instructors with the necessary resources (e.g., time, equipment) so blocks of material could be modified or presented in a tailored fashion. One could argue that tailored training can occur without all these factors being present, but the factors were correlates of tailoring in the Army courses we examined.

Lastly, it appeared that some factors, specifically "typical instructor-to-student ratio" and "typical section/subject length" were not that critical to tailoring. Instead, for example, instructors indicated they used grouping as a means to overcome the challenges of large course populations. And because instructors had limited time to closely assess all students, they mainly focused on assisting students who had trouble achieving the minimum standards, and did not devote much, if any, effort to tailor training to challenge students who met minimum standards. The reasons for section length not being strongly related to tailoring are not clear, but perhaps the section lengths did not differ substantially enough to have an impact.

### Characteristics of Instructors Who Said They Tailored Training

**Instructor preparation.** Instructors who tailored training did not provide any indication that they were chosen for their instructor duty via a special screening or selection process. Likewise, there was no evidence that these instructors received any special preparation prior to becoming instructors. However, interviews yielded some general information that can be used to describe the instructors who conducted tailored training.

**Instructor expertise in pedagogy and subject matter.** The most common characteristic was that instructors took ownership of student success. Instructors knew that the performance of their graduates reflected their abilities as an instructor; they took pride in the high-quality students they produced. To achieve this level of success, the instructors routinely offered personal assistance to students outside of normal class hours. Instructors who tailored training also expressed that they often performed as a mentor and councilor, sharing experiences with the students and expanding student vision for the application of the course material.

Expertise as an instructor was evident from the interviews. Although instructors had not received any special preparation, they typically discussed varied training techniques and methods they used and provided the supporting rationale for their approach. Even though they did not identify how they acquired the ability to tailor, instructors explained that they learned or knew when and how to adapt training to meet student needs.

These personnel were well-qualified in their domain. These instructors generally stated they were viewed by their supervisors and peers to be highly skilled in their domain, even though they admitted they did not have experience in all course areas. In some cases, the scope of the course material was so extensive that multiple instructors were required to cover all topic areas. Also, the instructors recognized the limits of their expertise and were usually able to obtain support from other experts in specific course areas when needed. The instructors might not always have the answer to student questions, but they knew where and how to find the answers.

**Interplay of Factors That Influence Tailored Training**

**Tailoring in existing courses.** Figure 2 summarizes the general flow of the major factors that influenced the tailored training described to us by the instructors, with graduation requirements being the primary driving influence on tailoring. Added to the graduation requirements, which set the stage for the need for tailoring, were conditions within the classroom under the instructor's or course manager's control which enabled tailoring, external support for tailoring, the extent of instructor preparation and/or experience teaching, and the nature of the student population. The instructor then had the ability and the inclination to integrate and consider all these factors in executing the appropriate types of tailoring. These factors were discussed previously in the report and are not elaborated upon here.

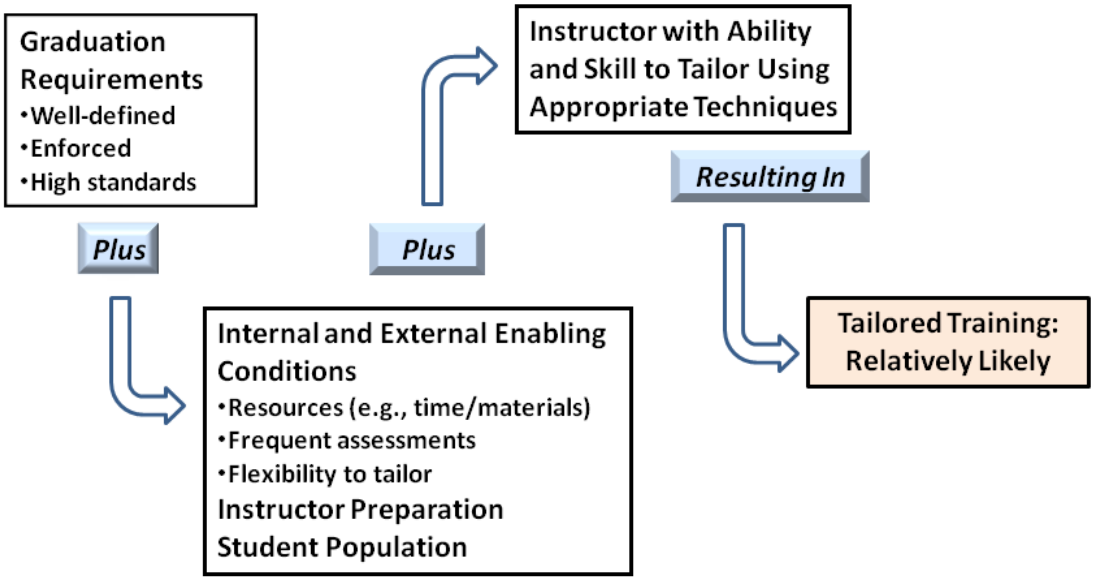


*Figure 2.* Factors impacting tailored training for the courses in the sample.

**Considerations in initiating tailoring – filling the tailored training void**. If we were to speculate about how to bring about tailoring training where there currently is none, the factors to consider change somewhat. Next we discuss what factors should be considered given what we learned from the instructors and what we know from the tailored training literature.

*An innovator, advocator or enabler for tailored training is needed*; someone who is aware of how tailored training might be implemented in a course, is able to persuade others that it is important and has benefits, and is able to implement or facilitate course modifications. This process could be similar to what Rogers (2003) described in his research on the diffusion of

innovations, as tailoring could be considered an innovation. Rogers repeatedly found that innovations are first adopted by "innovators," individuals who are willing to take risks, have close contact with scientific sources and other innovators, etc. As stated previously, the instructors who stated they tailored stressed the importance of individuals in their chain of command who allowed them to tailor, while some of the other instructors who said they did not tailor indicated they were not allowed to deviate from the POI. It appears there must be an advocate for tailoring if tailored training is to occur in a course where there currently is little or no tailoring.

*The next issue is determining whether tailoring is needed.* Many factors impact this decision, and not all aspects of a course warrant tailoring. Most would agree that tailoring is not warranted if familiarization is the intent. Nor is tailoring necessary where there are no salient differences in the status of students, but would be advisable where learning is impacted by critical individual differences. As indicated by our results, sections of courses where a high level of proficiency is required for graduates are definite candidates for tailoring. Also, sections of a course which are difficult for many students are candidates. And if students progress at different rates within a course, tailoring may be warranted. Some might question if there is sufficient time or sufficient instructors to tailor. Yet the types of tailoring vary, with some forms impacting instructional time and number of instructors, whereas others do not have a substantial impact on time or number of instructors.

Assuming tailored training is needed, *the types of tailoring* that could be appropriate must be identified. This could be decided based on the course intent, course content, student population, and training resources. Also what types of training can be done versus what should be done is an issue to resolve. Instructors and course managers need to be aware of the possible variations in tailoring, whether they are appropriate for a course or course content and to the salient individual differences in the student population, and whether a form of tailoring is likely to produce the desired results.

The nature of the subject matter (e.g., well-defined domain, planning tasks, conceptual focus, and combinations thereof) and the intent of the course or phase of a course will impact the type of tailoring. For example, tailored techniques most appropriate for highly procedural, hands-on tasks will not be appropriate for staff planning tasks. On the other hand, supplemental materials can apply as a means of tailoring in most courses---to help the weak students, to motivate students in the middle, and/or to challenge the good students. Supplemental materials can vary greatly; they can be exercises, self-paced computer-based training, research materials, mobile apps, etc. Another consideration is whether phases of a course could be restructured to provide a better instructor-to-student ratio when tailoring is desired. Would learning in small groups enable the instructor to devote more personal attention to students or to have peers assist? The ingenuity of the instructors is critical to making such decisions as they are most aware of what pedagogical techniques are most likely to work with the Soldier population and the specific course content.

Lastly, the requirements to *support and execute tailored training* should be addressed. An essential aspect of this requirement is *measuring or assessing individual differences* in order to determine the scope and extent of differences at the start of a phase of training as well as

during training to verify that tailoring is warranted and to enable the instructor to adapt as students progress.

It is critical to agree on the purpose of assessments as that decision affects the design of measurement instruments and the frequency with which they are administered. For example, tests administered at the start of a course may be designed to determine or predict who needs remedial training vs. who could potentially "opt" out of a course or parts of a course. Research (Schaefer, Blankenbeckler & Brogden, 2011; Schaefer, Blankenbeckler & Lipinski, 2011) showed that demographic information did not predict Soldier performance on criterion measures in Army courses. Tests focusing on prior knowledge were better predictors. In general, it could be erroneous to conclude a priori that a given prediction tool will function as desired. Therefore, pilot efforts may be necessary to determine if predictors relate to a course criterion as expected or need revision.

There are other ways in which assessments can support tailored training. It may be desirable to determine whether course prerequisites were successful in getting students to the desired level of proficiency at course start. If prerequisites were successful, then no tailoring is needed at that point. A common procedure is to use assessments, both at the start of and during courses or a block of instruction, to determine who needs remedial training and the nature of that training. However, the assessments can also be the basis for determining which students need to be challenged in some way. Given this intent, assessments would go beyond minimal levels of competency to determine which students are functioning at advanced levels. Assessments can identify strong and weak students if the intent is to balance competency across or within groups. If the intent is to continually adapt the instruction to student progress, then frequent and regular assessments are needed. Assessment procedures may also be central in motivating students, enabling the instructor to formally acknowledge student strengths and weaknesses, and to clarify how these differences will be integral to tailoring in the course.

In addition, *for tailoring to be successful, instructors must be prepared and allowed the flexibility to tailor*. They need the time and skill to assess students, and time to examine assessment results in order to capitalize upon them. They may need time and resources to develop supplementary materials. They may need access to technologies and equipment. In addition to resources, instructors must be adept at applying different modes of tailored training. Facilitating a small group requires different skills than one-on-one mentoring. Most likely instructors will need to be prepared to train the same material content using different methods. Skill in designing practical exercises which address individual differences may be needed. Although teaching experience is invaluable here, specific instructor training may also be needed. Expertise in the domain helps the instructor better understand the possible shortcomings from the student's perspective and allows better adaptation to students. Tailoring will most likely improve as instructors gain more experience and expand their capabilities to tailor; it may be unreasonable for tailoring to work flawlessly or as desired the first time. Lastly, a critical element is whether the instructor is motivated to execute tailoring.

Figure 3 summarizes the general factors to consider when initiating tailored training. However, once the decision is to tailor and the enabling conditions are in place, the heart of the

matter is the instructor. Successful tailoring depends on instructors who are competent in their domain, have the necessary pedagogical skills, and are motivated.

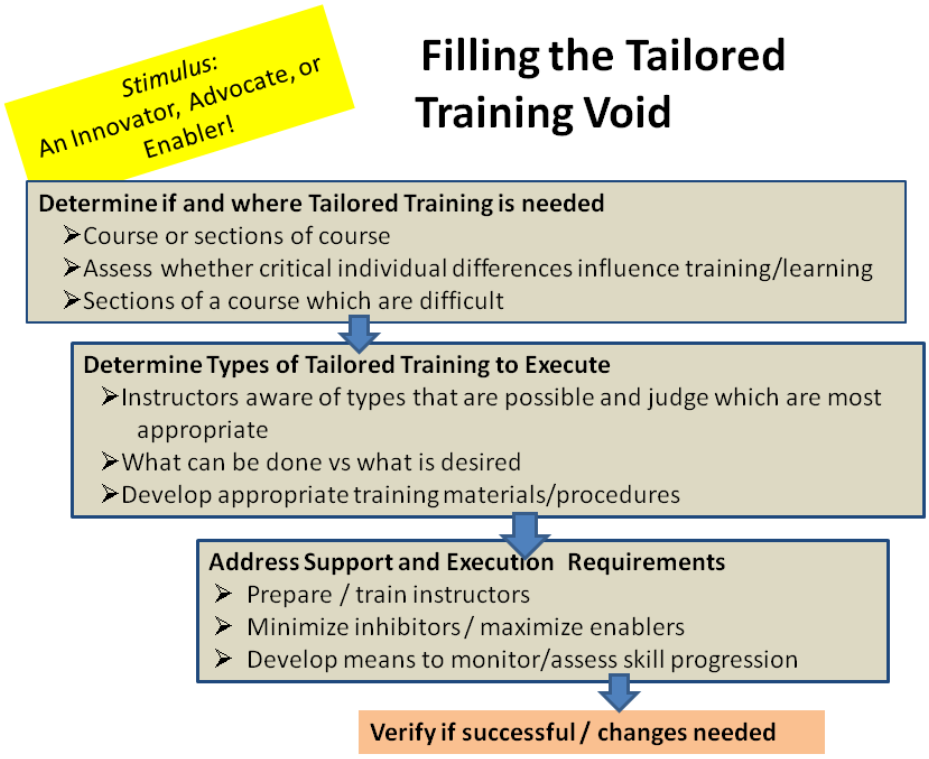


*Figure 3.* Factors to consider when initiating tailored training.

**Research Issues and Questions**

What are the implications of the findings for executing tailored training on a broad scale in the Army? First, there are major challenges in applying research findings on tailored training to Army practice. The tailored training research is quite diverse and not integrated. Furthermore, Army training settings and student populations are often quite dissimilar from those in the research settings. Consequently, although some general inferences regarding tailored training can be made from the literature, it is difficult to determine precisely the forms of tailoring appropriate for specific Army courses and to provide the necessary guidelines for effective implementation.

It appears there is no single template for tailoring applicable to all Army courses. The varying content and purposes of Army courses in conjunction with the heterogeneous student population influence the type and extent of tailored training possible and/or desirable. It is important to determine why and when tailoring is needed in a course, which in turn impacts the type of tailoring. Should tailoring be directed at helping the weaker students, challenging the stronger, or both? An interesting issue is whether a model can be developed for the types of tailoring which would be most effective in different courses. What are the defining

characteristics of a course or phases of a course that would benefit the most from tailoring? Is a high degree of tailored training necessary in all phases of a course, or is microadaptation by instructors sufficient? Would the different tailoring methods described by the instructors in this research transfer successfully to other courses where minimal tailoring exists?

Effective tailoring will not occur unless the instructor is also effective. Despite what we learned about the instructors who tailored, questions still remain about how to enable instructors to tailor. The instructors stated they had not received preparation for tailoring training, and many seemed to equate tailoring with remedial training, which is only one form of tailoring. If instructors were to receive training, a major question is whether general training on how to tailor would be sufficient or if training on specific tailoring types would be more effective. In the small-group cooperative learning research literature, teacher training included techniques specific to that setting, such as selecting appropriate tasks and determining the appropriate mix of student abilities and roles. Other forms of tailoring would require different instructor skills, such as diagnosing student problems and developing supplemental materials for both remedial and advanced training. Clearly, more than basic pedagogical skills are required, and different forms of tailoring require different skills. A quick solution might not be effective, as Corno and Snow (1986) stated, adaptive instructional skills cannot be realized through one-shot workshops. It is likely that research on training pedagogical skills related to different tailoring approaches would be beneficial.

Unfortunately, we do not know how the instructors we interviewed developed their skills, the length of this process, and what they believed is needed to develop such expertise in others. One question is whether the instructor's ability to tailor training is a function of the frequency of teaching a specific subject. Although we did not specifically ask instructors how often they taught their courses during their typical two-to-three year tenure as an instructor, this frequency is probably critical to the rate at which they acquire subject-matter specific pedagogical knowledge, which provides them with the knowledge and associated heuristics to easily and quickly address individual differences (Corno, 2008; Putnam, 1987). The rate at which such expertise is acquired could be examined in any tailored setting, but the ubiquitous nature of microadaptation makes it sensitive to such pedagogical skills and would be a good "test bed" for investigating this question. Any approach to enabling instructors to tailor must also consider the fact that for public school teachers, teaching is their career. Yet for Army instructors, being a Soldier is their career, while being an Army instructor is one of many duty assignments in that career.

The use of small groups, working on complex problems or collective tasks, as a means of facilitating individual learning bears further investigation. This is particularly important given the emphasis in ALC 2015 (DA, 2011) on collaborative groups and the many ways in which groups were formed and used in the courses examined. Key issues to address are what types of groups are most effective in different Army settings and the extent of tailored training that actually occurs in small groups; if and how the group process directly addresses individual strengths and weaknesses; and what types of tasks work best with small groups.

We did not expect to find courses that approximated tutoring situations. However, a few did, and they typically involved hands-on training with equipment. Yet, it is not clear how well

the student-teacher dialogue and techniques demonstrated in the tutoring research, which usually focused on cognitive tasks, would map onto hands-on tasks typical of Army training. Research with expert Army tutors is needed as the findings could serve as guidance for other instructors.

We need to understand why some forms of tailoring were not common in the sample. These include assessments to systematically guide instruction and to identify student strengths and weaknesses, self-paced instruction, accelerated instruction for talented individuals, and supplemental materials for remedial or advanced training purposes. As some of these techniques have been used in the Army previously, it is important to identify why they apparently are not present now. Could these techniques be used effectively now or are their valid reasons why they were not present in our research?

Another issue regarding limited implementation of tailoring is the need to determine the best means of tailoring when high levels of proficiency are not required. Although instructor interviews indicated that courses where expertise was critical, and the graduation requirement was well-defined and strictly assessed and enforced were more likely to attend to individual differences, not all courses fit this template. It is therefore important to identify the most effective tailoring methods for these other courses. For example, is attention to students who need remediation sufficient, and/or would an accelerated learning path be effective with some students?

The role of valid, continuous assessments and how they impact the tailoring that is executed have been underplayed and need to be addressed. For example, do instructors' subjective judgments of students' capabilities agree with objective-based measures? The reports by Schaefer and others (Schaefer, Blankenbeckler, & Lipinski, 2011; Schaefer, Blankenbeckler, & Brogden, 2011) show that judgments based on demographic-type information are not nearly as predictive as are measures of prior knowledge. Also what types of assessments are sensitive to individual differences; and how often should assessments be given? Tailoring based on invalid assessments could lead to maladaptive training (Corno & Snow, 1986).

A major research challenge seems to be how to facilitate tailoring with limited time and resources. Not all tailoring needs to be one-on-one interaction between a student and instructor. Although developing other tailoring techniques besides one-on-one instruction (e.g., development of special materials or effective and valid techniques for identifying students who could be adept at assisting other students) may take time and resources initially, time and resources may be saved once implemented.

## Conclusions

The definition of tailored training that served as the basis for the research addressed adapting to critical individual differences regardless of the proficiency level of the student. Thus tailored training is perceived as encompassing more than remedial training; the skills of all students should be increased, thereby increasing the competency of all.

Even though tailoring training, both content and training techniques, to meet student needs enhances the learning experience, the research findings indicated that tailoring training

was only selectively implemented in Army courses. No single template for tailoring applied to the substantial diversity of courses in our sample and by extension, no single template can be applied to the Army as a whole where the diversity of courses is even greater. It is clear that reasons for tailoring and the approaches used by the instructors varied based on the student population, course intent, course environment, and instructor capabilities.

Instructors indicated that tailoring occurred in the following forms: approximations to face-to-face tutoring, learning in small groups where the composition of the groups and the problems presented to the groups varied with the course, peer-to-peer instruction, use of small groups to provide more access to equipment/systems, remedial training, and varying task problem complexity and difficulty primarily to challenge students who were performing well. One limitation of the research approach was that instructor interviews did not allow us to verify the extent to which tailoring to critical individual differences actually occurred.

Based on our sample, it appears that some of the major types of tailored training are not, or only rarely, implemented in Army courses. For example, formal pretests were rare or nonexistent. Therefore, students were not divided by ability, experience, and/or prior knowledge with instruction adapted to these differences. Nor were individuals with weak prerequisite backgrounds identified so remedial training could be implemented early in the course. No evidence was found of self-pacing to allow talented students to progress through the course more rapidly. No intelligent tutoring systems were in place. Rarely did instructors indicate they deliberately modified their instruction to different subgroups because of differences in knowledge acquired throughout a course.

In addition, in some instances, tailoring training does not appear to be necessary to satisfy Army requirements. For example, in courses where students merely need to become familiar with the course material and a high level of proficiency is not expected, instructors can present standardized blocks of material that ensure students achieve the minimum common level of knowledge and understanding.

In general, when attempting to ascertain the likelihood of a course conducting tailored training, using a public domain source such as ATRRS will not provide an accurate depiction of individual courses. Although satisfactory for sample selection purposes, ATRRS is not adequate for identifying which courses actually have tailoring or determining what type of tailoring occurs within a given course. The course parameters examined here were not perfect indicators of tailoring and they certainly did not define the variety of tailoring which instructors described. The accuracy, scope, and appropriateness of any potential parameter must be verified with course instructors and managers. It is important to remember that the course parameter findings reported here may not generalize to other Army courses, as the sample was not designed to be a representative sample of all Army courses, but rather a sample that represented courses where tailoring was highly likely.

Instructors are key to implementing any form of tailored training. Before tailoring can be implemented, impediments must be addressed. Instructors must be enabled to adapt to students, and given the necessary time and resources either prior to or during a course to determine the most appropriate form of tailoring. A key factor in tailoring is being aware of the critical

differences among students that warrant tailoring. Therefore instructors must test/monitor individual student status and then recognize what must be done. Failing to systematically attend to student differences is a definitive inhibitor to tailoring and we found that only half the courses in the sample used assessments prior to or regularly during the training process. In addition, different forms of tailoring require different pedagogical skills, which is a major challenge.

The driving force behind courses that had tailored training appeared to be that graduates were to be placed in positions of individual responsibility, and therefore a high level of proficiency was required. These courses included ones where graduates were responsible for human life, equipment safety, high dollar-equipment, or were to be in high visibility or areas of high command emphasis. It was critical that instructors attended to individual differences to ensure all graduates were competent. Noteworthy is the fact that this course dynamic (i.e., criticality of the graduates' level of proficiency) has not been investigated in the experimental research literature or the more applied tailored training research with public school settings.

In conclusion, tailoring did exist in Army courses, particularly where the graduation requirements were well-defined, strictly assessed and enforced, and high levels of proficiency were required. In those courses, instructor attention to individual differences was essential. The critical features of that tailoring varied with the purpose of the course and could not be predicted; no single template was applicable. Given the gaps between the research literature and the variations in best practices of tailoring depicted by the Army instructors interviewed as well as the limited amount of tailoring in courses which focus on students meeting a minimum requirement, a greater understanding is needed regarding which modes of tailoring would be effective in the broader population of Army courses and how to initiate that tailoring.

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## APPENDIX A

## Acronyms and Abbreviations

| | |
|---|---|
| ALC | Army Learning Concept |
| ASI | Additional Skill Identifier |
| ATRRS | Army Training Requirements and Resource System |
| DA | Department of the Army |
| DS | Drill Sergeant |
| IET | Initial Entry Training |
| MOS | Military Occupational Specialty |
| NCO | Non-Commissioned Officer |
| PFC | Private First Class |
| POI | Program of Instruction |
| TRADOC | U.S. Army Training and Doctrine Command |
| WLC | Warrior Leader Course |

## APPENDIX B

### Best Practices in Tailored Training (Interview Questions)

The purpose of this research effort is to identify some of the ways that instructors go about adapting or modifying their training in order to accommodate differences in students. We recognize that students arrive at courses with varied backgrounds in knowledge, skills and experience, and we understand that not all courses or instructional settings are able to adapt for these varied aspects. What we are attempting to identify is first, do these individual differences matter in your training? If they matter, how you determine if and when these individual differences exist? What are the differences you look for? Then, very importantly, how you adapt or modify your training based on this information? These training adaptations or modifications can be formal or informal (on-the-spot). If you recognize there are individual differences, but do not adapt your training, we're also interested to know what factors prevent you from adapting or cause you to choose not to adapt? Your participation is voluntary, but your responses will assist us in determining techniques that have proven successful in adapting training to Soldiers.

*(Have interviewee read Privacy Statement and sign participation agreement.)*

As the first step, we would like to verify some information:
Course Title: _____
Interviewee: _____
(duty position – trainer, leader, manager, etc)

**Verification/Confirmation of ATRRS Information**

ATRRS provides some information about your course that we'd like to verify:

Length of Course: *(fill-in before interview) – obtain correct information if ATRRS is wrong*

Class Size: *(fill-in before interview) – obtain correct information if ATRRS is wrong*

Prerequisites: *Review list of prerequisites; check enforced (yes/no); make notes below table.*

| Prerequisites | Enforced | |
|---|---|---|
| | YES | NO |
| 1. Fill-in the prerequisites extracted from ATRRS | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| 6. | | |
| | | |

Instructions to interviewer are in italics.

Notes concerning incorrect or additional prerequisites:

1. _____
2. _____
3. _____
4. _____
5. _____

**Course Prerequisites**

1. How do you identify students who might be lacking in the prerequisites? (This includes the stated prerequisites as well as the assumed skills and abilities that you would expect the student of that grade level to possess.)

2. When you identify students who are lacking, what are you able to do about it (modify training, remedial training, spend extra time with them, dismiss from course, etc.)? *(Probe for specific techniques or procedures)*

- For modifications that you have made, did they produce desired results? If not, what was lacking and why?
- Are there other actions that you think would be better?

3. When you identify students who surpass the prerequisites or already have the skills and knowledge that will be trained in the course, what are you able to do about it (modify training, have them assist you/others, dismiss from course, give them more challenging or advanced tasks, etc.)? (*Probe for specific techniques or procedures.)*

- For modifications that you have made, did they produce desired results? If not, what was lacking and why?
- Are there other actions that you think would be better?

**Student Background**

1. Are there specific experiences gained during deployments that significantly improve student performance in the course? (Yes No)

a. If YES, at what point in the course are the benefits from deployments evident *(Probes - at the start of the course, during the course, in certain content areas)*?

How do you detect (become aware of?) differences in students with varying deployment experiences that are relevant to the course?

- What are these experiences?

- How do they impact course performance?

- Given these differences, how do you adapt your instruction/training?

Instructions to interviewer are in italics.

- *Possible probes to ask:*
- *Do you have them share in some way the benefits of their deployments with other students?*
- *Do you break up into small groups?*
- *Do you have them lead discussions?*
- *Do you have them prepare special training materials?*

*Etc.*

*If the instructors indicated they modified or adapted their instruction/procedures, ask:*
Were these changes successful or effective? Why or why not?

*If they were unable to/did not modify training, ask why?*

b. If NO, why do you think deployments have not impacted performance in your course?

2. What is the impact on course performance if Soldiers do not have deployment experience?
*If there is an impact and it is negative, ask:* How do you address these weaknesses?

**Now I will ask you a similar set of questions regarding the impact of other student experiences and duty assignments.**

3. Are there other duty assignments, experience, group of assignments or experiences, or training that appear to be common to most of the students who perform well in the course or on a section of the course?

a. If YES, at what point in the course are the benefits from these assignments and experiences evident *(Probes - at the start of the course, during the course, in certain content areas)?*
-How do you detect (become aware of?) these differences in students?

- What are these experiences?

- How do they impact course performance?

Given these differences, how do you adapt your instruction/training?
- *Possible probes to ask:*
- *Do you have them share in some way the benefits of those assignments or experiences with other students?*
- *Do you break up into small groups?*
- *Do you have them lead discussions?*
- *Do you have them prepare special training materials?*

*If the instructors modified or adapted their instruction/procedures, ask:*
Were these changes successful or effective? Why or why not?
*If they were unable to/did not modify training, ask why?*

Instructions to interviewer are in italics.

4. What is the impact on course performance if Soldiers do not have some or all of these duty assignments, experiences or training that you just mentioned as being relevant?

*If there is an impact and it is negative, ask:*

a. How do you address these weaknesses?

b. If NO, why do you think the students' prior background does not impact performance in your course?

**Course Composition and Student Performance**

1. Are there selected subjects, sections, or specific skills trained in the course that students (some or all) seem to have difficulty with?

- Do you have any indicators of marginal or poor performance in these areas prior to the training (prerequisites, earlier blocks of training, pretest, etc.)?
- What actions have you tried or do you take to assist the challenged students?
  *(Probe to define the training activities or accommodations made to assist students.)*
- What actions would you like to try or implement to assist students?
- What are the obstacles to implementing these training activities?

2. Are there negative consequences to not graduating, being dismissed, or dropping the course?

If YES, what additional training is provided to assist students who have difficulty?

3. Do students perceive positive benefits to course graduation, completion, or receiving honors status upon graduation?

If YES, what actions or accommodations do you take to permit them to learn more, excel in the course, or improve their knowledge and skills beyond course/task requirements?

4. Are retests required for students who fail sections or subjects of the course?

- If YES, what actions are conducted prior to retests (reviews with instructor assistance, remedial training, study hall)?
- What subject matter is emphasized, and how, during reviews, study hall, etc.?

5. Are additional training activities available for students who pass the test, but desire to improve their knowledge, skills, or performance?

6. If you have never tried adapting or modifying any of your training, why not? *(Ask only if prior responses indicated no adaptation or modification).*

Instructions to interviewer are in italics.

7. Are there opportunities within your course to adapt or adjust training to the student needs and abilities that you would like to implement but we have not discussed? Consider students with problems, the middle-of-the-class students, and the exceptional students. Yes No

- If YES, what are they?
- Is there a plan to implement any of these?

Before we conclude the interview, I would like to review and summarize the major points you have made regarding individual differences in the students in your course, and the techniques, methods, or procedures you have used to adapt to those differences.

Instructions to interviewer are in italics.

# APPENDIX C

## Additional Samples of Tailored Training Practices in the Targeted Courses

As stated in the report, instructors explained various techniques they used to assist in tailoring training to the students. They identified some techniques to assess student abilities and performance so they could determine which students might need tailored training. The following samples clearly illustrate that there is no single best solution, but rather a variety of techniques to adapt instruction, depending on the instructor capabilities, the course environment, and the intent of the course. The samples also reflect the adaptive pedagogical techniques which instructors developed for their courses and student population. The samples are generic to avoid compromising information obtained from any specific course. They are in addition to those cited in the body of the report.

### Adapting to Individuals Based on Performance Monitoring

An instructor would observe a student actually performing a task in order to provide one-on-one assessment and immediate feedback on performance. This technique was used for hands-on tasks, such as negotiating a land navigation course, inspecting or maintaining a piece of equipment, and operating a system.

Instructors would closely observe student participation in the classroom discussions and in group exercises. They tried to assess if slacking or lack of participation was due to lack of expertise or to weak leadership and motivation. Based on the assessment, the instructors would tailor how they dealt with that student. They could possibly place the student in a leadership role to increase the student's responsibilities or provide additional training in weak areas, if needed.

Peer assessment and peer counseling were used for multiple purposes. Instructors would actually have a student evaluate another student's performance and conduct counseling, while other students observed. This placed each student in a role where he/she must know what was to be done, was able to assess another's performance, and was able to confront another student in a constructive manner. This situation allowed the instructor to assess multiple students simultaneously and tailor feedback to the specific situation.

An instructor assigned a student a role to teach a class or block of material. Not only did the student learn how to perform the task, but also had to master the material well enough so he/she could explain it to others. This helped the student learn to train the skill and not just to perform the skill.

Sometimes instructors allowed the student to fail a task or mission so long as actions remained within safety limits. Failing helped the student recognize actions that will not work so different approaches would be attempted. When the student failed or committed an error, the instructor assembled the class and had the student explain what he/she did, what was wrong, and how he/she planned to correct it. All could learn from the error. The one who committed the error received input from others on how to prevent, detect, and correct the error.

"Peer pressure" was occasionally used to help focus on weak areas for selected students. When instructors detected a weakness in a student, they devised a project that involved that area then put the weak student in charge of the project. The weak student was required to learn the material and get others to support.

Assigning homework required students to study and practice material outside of classroom time. Specific assignments were aimed at the students' assessed weak areas. The instructor would then review and evaluate homework performance at the start of the next training session to determine which students might be having difficulty and in what areas. This allowed instructors to ensure students had the necessary foundation prior to moving ahead with the next section of material.

Instructors required students to brief the results of exercise work to share their solution. The instructor ensured the student discussion not only addressed what the solution should or could be, but "why" the student took the course of action or achieved the given results. This approach helped expand each student's thought process to a wider range of ideas.

Instructors constructed a real environment face-to-face encounter tailored to each student's perceived weakness. The student had to interact with a role player to obtain desired information or to accomplish the objective. Instructors told the role player how to behave, what information to provide, and how to challenge each student.

Challenging Strong Students

For strong students, instructors would assign additional project work, with very "loose" guidance. This allowed the student to be creative and adaptive with ideas and potential solutions rather than follow all standard procedures in a lock-step fashion. Instructors monitored and assisted, as necessary, allowing the student to practice and learn.

Instructors sometimes conducted one-on-one casual side discussions with more senior students who were leaders. The intent was to help them to not only learn skills, but also to ensure they grasped the leadership role they had for others who performed the task under the leader supervision. Instructors shared "tips" with these leaders for how to succeed.

For some exercises and based on student abilities, the instructor provided students some limited training then assigned them a task to perform. Using the upfront limited training, students usually only performed part of the task. The instructor allowed students to begin the task and even explore possible solutions. At a point, the instructor conducted some discussion and additional training to assist students as they continued with the task.

Based on student questions and interaction with students, an instructor identified when a student might have interest in a specific topic area. The instructor then assigned additional work or research in that area. Some instructors had a library of books available to loan strong students or ensured selected books were available through a local reference source. The intent was to provide students more advanced material so they learned material beyond the course basics. The

instructor also assisted the student in contacting and communicating with an expert in that area to provide more focused assistance. When the student expanded personal expertise in this area, the student was allowed to share this with other students.

Modifying Content or Training Approaches Based on Students' Interests or on the Instructor's Experience with Previous Classes

Through questioning students, relying on informal dialogue, or by having students complete a short questionnaire, the instructor attempted to determine each student's interests. The instructor then linked training situations, examples, and memory tools to the student's area of interest. For example, if a person liked sports, the instructor would try to relate how to remember specific task details to how the person recalls sports statistics.

When presenting new material, instructors would attempt to use analogies that fit with students' prior knowledge and/or experience. Examples included using analogies with money (e.g., dollars and cents with percentages) to determine calculations needed for system operation or use vehicle engine operations (e.g., functions of a battery, radiator, transmission) as an analogy for tactical operations or organizing units to maximize chances for success in a military operation.

Experienced instructors would generally know the typical problems students encountered in completing portions of courses. Some would intentionally emphasize this material during class presentations. Other instructors would develop and provide additional practice exercises which highlighted the usual points of failure.

Instructors conducted a regular counseling and mentoring session with each student to discuss course progress and any personal issues. This allowed the instructor to direct specific study topics for each student's weak areas and to assist any student with issues that could be impacting course performance.

Assistance Outside of Class Hours or in Study Halls

During both optional and mandatory study halls, instructors would be available to assist students by reviewing material covered in class. Some instructors also provided additional practice problems or exercises for students to avoid merely repeating what was done in class.

In addition to being available for study halls, instructors would make themselves available via phone or e-mail so students could contact them outside of classroom hours. Some instructors would meet with students one-on-one, at the student's request for assistance.

Some instructors considered the training schedule a guide and did not adhere to specified time blocks on the schedule. Through practice and assessment of student performance they ensured students had met the required standard prior to moving ahead with new material. This required retaining students past normal class time.

In some instances, instructors arranged for students to take some equipment items with them after class hours so they had extra hands-on practice. Similarly, instructors arranged so students

could access equipment during non-duty hours, perhaps with an instructor or duty supervisor. This provided weaker students more chances to practice.

Peer-to-Peer Instruction

Students with prior knowledge and skills in a particular subject area were selected to assist other students, serving as assistant instructors. In some cases, these more advanced students would be required to develop and present some block of training to the class. Some examples include: students who had lived or travelled in a foreign country might share that experience about other cultures; or, if a student had additional knowledge about a topic, based on attending other courses or civilian education, that could be shared with other students.

Learning in Small Groups

When a student was selected to lead a group of students, instructors used varying techniques to determine who would fill the leader roles.

a. A strong student could be chosen as the initial leader. Even if instructors had demonstrated how to perform the task, this allowed the weaker students more opportunities to observe how a task should be performed.

b. A weak student could be chosen as the leader. This would force the weaker student to be in the main light for observation and closer supervision. This also allowed stronger students to provide assistance. When weaker students performed as leaders, instructors would often select a strong student as an assistant to the weaker student.

c. For the more challenging tasks and leadership roles, the more skilled students would be selected as the leader.

d. Weaker students would be selected more frequently to serve as leaders so they would have more opportunities to practice.

Instructors would arrange the classroom seating or location of students to facilitate providing assistance. In some cases, less experienced students would be grouped at the front of the class so the instructor could closely observe student performance and quickly offer help. In a similar fashion, lesser experienced or weaker students would be clustered so more assistant instructors or supervision could be provided in that area. Another technique was to disperse weaker students throughout the classroom and intersperse them among the more experienced students. This allowed for better peer-to-peer assistance. Instructors might change seating arrangements periodically based on the progress of the students, or because students strong in some portion of the course material might be weak in other portions.

Instructors organized students into groups for exercises and hands-on practice to allow more students to perform tasks simultaneously, especially when access to equipment or systems might be limited. Using groups also created the condition where the instructor could focus attention to a small group of students at a time and direct the assessments and feedback to specific areas for each group. Instructors indicated they would also periodically alter group composition so students had to adjust to working with different students and to preclude a student from regularly "carrying the load" or taking the lead within the group.

As part of practical exercises, instructors incorporated group discussions, within groups and between groups. This allowed more sharing of experiences among students so the less experienced and weaker students benefitted from others' experience. Likewise, the instructor allowed groups to question and critique other groups to better share ideas and approaches. This avoided having students merely learning a fixed "school solution" and increased their potential adaptability for other situations.

Special Techniques/Equipment to Monitor Student Status

In some cases, instructors modified standard training devices or equipment in order to better observe student performance and provide feedback to students. As an example, an instructor used standard video recording equipment connected to a system in order to see what the student was viewing, the scenes and actions were recorded, and at the end of the event, the instructor could playback the recording to provide a personal assessment to the student or to a larger group of students.

One instructor used the Classroom Performance System (CPS) to administer checks on learning throughout the day. CPS is a computerized system that projects questions on a screen. Each student has a remote control to select an answer to the question by pointing at the screen. The CPS collects all answers, by student, and reports who is right/wrong. This allows all students to answer every question and allows the trainer to see who is weak/strong, by question/topic area, with instantaneous feedback. The drawback is that the trainer must create these checks on learning and program them into the CPS which requires the trainer to have time and experience with the CPS.

## APPENDIX D

## Statistical Tables

Table D-1

*Distribution of Class Size for Courses Most and Least Likely to Tailor*

| Class size: # students in increments of 10 | Courses most likely to tailor: high level of proficiency and enforced graduation requirement | | Courses less likely to tailor | |
|---|---|---|---|---|
| | # courses | % courses | # courses | % courses |
| <=10 | 2 | 9% | 3 | 11% |
| 11-20 | 9 | 39% | 10 | 36% |
| 21-30 | 7 | 30% | 5 | 18% |
| 31-40 | 4 | 17% | 3 | 11% |
| 41-50 | 0 | 0% | 0 | 0% |
| 51-60 | 0 | 0% | 1 | 4% |
| 61-70 | 0 | 0% | 1 | 4% |
| 71-80 | 1 | 4% | 1 | 4% |
| >=81 | 0 | 0% | 4 | 14% |
| Total | 23 | | 28 | |

*Note.* Minimum class size for each category was 5. Four largest class sizes were: 80 to 100, 100 to 115, 200, and 350. Courses likely to tailor had small classes, i.e., 95% with 40 students or less. Courses less likely to tailor also had small classes (75% with 40 students or less).